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ABSTRACT

This test manual presents information on the Brockport Physical Fitness Test (BPFT), a criterion-referenced fitness test for children and adolescents with disabilities. The first chapter of the test manual includes an introduction and target populations are identified, defined, and classified. The second chapter presents information on the conceptual framework for the test. Physical activity, health, and health-related physical fitness are discussed and their relationships to the purposes of the BPFT are presented. Also described in the second chapter is a personalized approach to physical fitness testing. The third chapter presents recommendations on using the BPFT along with three alternatives for using the tests. Chapter 4 includes health-related, criterion-referenced test selection guides and standards for assessing physical fitness. This information is presented in tables that identify health-related parameters of the general population and selected areas of specific disability. Chapter 5 includes general recommendations for test administration and test items. Chapter 6 deals with the testing of the physical fitness of youngsters with severe disabilities. The final section of the test manual includes appendices that contain a body mass index table, information on purchasing and constructing unique equipment, and a glossary of terms. (CR)

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ED 433 628

The Brockport Physical Fitness Test Manual

THE NATIONAL FITNESS TEST FOR YOUTH WITH DISABILITIES

Test Manual
Developed in Connection with

by
Joseph P. Winnick and Francis X. Short
State University of New York, College at Brockport

1998

This book was developed as a part of Project Target which was conducted at the State University of New York, College at Brockport. Project Target was supported by the Office of Special Education and Rehabilitative Services (OSE/RS), U.S. Department of Education, Project No. HO23C30091. The contents presented herein are those of the authors and do not necessarily reflect the position or policy of OSE/RS or SUNY college at Brockport and no official endorsement should be inferred.

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Preface

From 1993 to 1998 the State University of New York, College at Brockport was funded by the Office of Special Education and Rehabilitated Services, U.S. Department of Education, to develop a health-related criterion-referenced physical fitness test for youngsters with disabilities, ages 10-17, as a part of Project Target. A key element of the project was to develop standards which would provide targets for the attainment of healthful living through physical fitness. In addition, Project Target was funded to develop an educational component which would enhance the development of health-related fitness of youngsters with disabilities. Project Target was directed by Joseph P. Winnick and coordinated by Francis X. Short. The population of youngsters with disabilities targeted in this project were youngsters with mental retardation, blindness, cerebral palsy, spinal cord injury, or amputation and/or congenital anomalies. Although these disabilities were targeted, the result of the project contributed to a process of physical fitness testing which can be used with other areas of disability and youngsters in the general population.

The test that has been developed through Project Target has been designated as the Brockport Physical Fitness Test (BPFT). This manual presents information necessary to understand the test, administer test items, and to be able to interpret the results of testing. Information on validity and reliability is summarized here; detailed information regarding validity and reliability can be found in the BPFT Technical Manual which is available as part of the software package associated with the test. The first chapter of the test manual includes an introduction and target populations are identified, defined, and classified. It is important that all testers become familiar with this information.

The second chapter presents information in regard to the conceptual framework for the test. Physical activity, health, and health-related physical fitness are discussed and their relationships, for the purposes of the Brockport Physical Fitness Test, are presented. Within this second chapter, a personalized approach to physical fitness testing is described. This personalized approach includes the identification of health-related concerns, the desired physical fitness profile which would emerge from the health-related concerns identified, the establishment of components of physical fitness to be measured, the identification of test items which would measure status in regard to the components of physical fitness, and the development of standards associated with desired levels of health-related physical fitness.

The third chapter presents the author's recommendations on using the Brockport Physical Fitness Test. Three alternatives for using the test are presented. The first relates to how to use the test when using existing test items and standards in the BPFT. Secondly, it presents information on adjusting the BPFT for youngsters with disabilities. Finally, the use of the Brockport Physical Fitness Test with other tests of physical fitness is discussed. The final part of this chapter deals briefly with IEP development.

The fourth chapter of the test manual presents health-related criterion-referenced test selection guides and standards for assessing physical fitness. This information is presented in tables which identify health-related parameters of the general population and selected areas of specific disability. Several tables presenting standards are included in the remaining pages of this section.

The fifth chapter of the test manual includes general recommendations for test administration and test items. The general recommendations for test administration include recommendations for administering all or most of the test items. Subsequently, all of the test items to be used as part of the Brockport Physical Fitness Test are presented. Although the number of test items for each individual will generally fall between four to six, this section includes a description of 27 test items recommended for the measurement of physical fitness of this diverse group. The object of test items, a description of how they are to be administered, the equipment needed, ways of scoring, trials required, test modifications, and suggestions for test administration are presented. Test items are presented within categories reflecting the components of physical fitness used in the study: aerobic functioning, body composition, and musculoskeletal functioning including muscular strength and endurance and flexibility/range of motion.

The sixth chapter deals with the testing of the physical fitness of youngsters with severe disabilities. In designing the Brockport Physical Fitness Test it became obvious that not all disabilities or levels of function could be accommodated through a single physical fitness test. The Brockport Physical Fitness Test is a health-related criterion-referenced test appropriate for most youngsters with disabilities and unique needs related to physical fitness. However, it may not be appropriate for youngsters with severe disabilities. Thus, a few comments regarding the assessment of physical fitness of individuals with severe disabilities are offered. In this section, it is clearly indicated that instead of measuring physical fitness it might be more valid to measure physical activity in this population. If physical fitness is measured, test items may require task analysis and the use of individualized rather than health-related criterion-referenced physical fitness standards. Thus, two orientations related to the measurement of physical fitness or physical activity of individuals with severe disabilities are offered. One relates to task analysis and the other to the measurement of physical activity.

The final section of the test manual includes appendices. The appendices include a body mass index table which would expedite a computation of the body mass index, an appendix dealing with the purchasing and constructing of unique equipment, an appendix presenting a glossary of terms, and the final appendix in which the many contributors to the project are identified.

In presenting the Brockport Physical Fitness Test, the authors wish to emphasize that they consider this to be a point of departure for a valid and reliable test of physical fitness. There is little question that the test items and standards suggested in this manual will require continued scrutiny and study. Information on the development and establishment of the Brockport Physical Fitness Test is presented in other sources and should be studied thoroughly for a full understanding of the rationale for the test as well as the basis for the test items and standards recommended.

Acknowledgments

The Brockport Physical Fitness Test (BPFT) was developed as a part of Project Target with the help of a diverse group of persons and institutions. Clearly, the project could not have been completed without the cooperation of many individuals, schools, and agencies throughout the United States. The project did not have the resources to fully compensate individuals for their contributions. Those that helped did so believing that their efforts would result in a project that would be helpful in enhancing the health-related fitness of individuals with disabilities. The names of individuals and educational institutions making contributions to the project appear in the appendix. The authors of this test manual extend deep gratitude to these people and places. In addition to them, thanks is given to the many parents and youngsters who volunteered their time and effort for testing purposes. They also believed that the project would bring benefits to youngsters with disabilities.

In many cases, individuals made extraordinary contributions to this project. At the forefront of these contributors were the Project Target Advisory Committee. The individuals on the advisory board provided overall guidance to Project Target in general, and to the development of the test manual in particular. The committee also served as a panel of experts. The outstanding advisory committee included Kirk J. Cureton, Ph.D., University of Georgia; Harold W. Kohl, Ph.D., Baylor Sports Medicine Institute; Kenneth Richter, D.O., Medical Director, United States Cerebral Palsy Athletic Association; James H. Rimmer, Ph.D., Northern Illinois University; Margaret Jo Safrit, Ph.D., American University; Roy J. Shephard, M.D., Ph.D., D.P.E., University of Toronto; and Julian U. Stein, Ed.D., George Mason University (retired).

Special recognition is extended to Paul Surburg, Indiana University. Paul gave continued advice in the development of test items and standards associated with flexibility/range of motion. Special recognition is also extended to Bo Fernhall, George Washington University. Bo gave the project much insight in the area of aerobic fitness for individuals with disabilities and conducted some valuable research relative to the development of the Brockport Physical Fitness Test. Patrick DiRocco, University of Wisconsin at La Crosse was extremely helpful in giving valuable input on test items relating to musculoskeletal functioning.

Special appreciation is extended to Pam Maryjanowski who is associated with the Empire State Games for the Physically Challenged. Pam was particularly helpful in gaining access to subjects for the study. Two other individuals who also made data collection possible in relationship to the project were Paul Ponchillia, Western Michigan University and Sister Seraphine Herbst, Director of the Holy Childhood School in Rochester, New York. Arnie Epstein and Bob Lewis from New York City Public Schools were extremely helpful in organizing data collection efforts in that school district. Each of these persons very willingly and very ably contributed to data collection efforts which were important for the development of the Brockport Physical Fitness Test.

One important function in relationship to the development of standards in the Brockport Physical Fitness Test was to test a general (nondisabled) population of youngsters. The Brockport Central

School district was very important in this regard. More than 900 subjects were tested in the district and these data served as a source for the development of health-related criterion-referenced physical fitness standards. Thanks is given to the administrators of the school district and 15 physical education teachers associated with the district who gave much cooperation and help when their students were tested.

Gratitude is expressed to Richard Incardona for drawing several of the figures appearing in this test manual. This manuscript was typed repeatedly by the following enthusiastic assistants: Melissa Zurlo and Paul Plavetzki. Also thanks is given to many individuals who posed for pictures or sketches included within the manual. Included in this group were Kevin Wexler, Kelda DePrez, Lori Volding, Travis Phillips, Lori Erickson, Tim Coyle, Wendy Kohler, Ellen Gill, Michelle Shea, Tucker Short, and Stephanie White. Several youngsters with or without disabilities also posed for pictures.

Professional organizations endorsed and cooperated with the project. Thanks is extended to the American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD) and to the National Consortium for Physical Education and Recreation for Individuals with Disabilities (NCPERID) for supporting the original proposal for funding the project and providing opportunities for several presentations regarding the BPFT to be made at professional meetings. Gratitude is extended to the Cooper Institute for Aerobic Research in Dallas, TX and to the Prudential Insurance Company of America. The Prudential FITNESSGRAM served as a prototype for the BPFT. Test items and standards associated with this test served as an important reference for test items and standards associated with the Brockport Physical Fitness Test. This connection enhances the linkage between the BPFT and a test of fitness recommended for the general population.

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Chapter I

Introduction

Overview

The Brockport Physical Fitness Test (BPFT) is a health-related criterion-referenced test of fitness. The term health-related is used to distinguish objectives of this test battery from one that might be more appropriately related to skill or physical performance. The phrase criterion-referenced is used to convey that the standards for evaluation are based on values believed to have some significance for ones health. Criterion-referenced standards can be established in a number of ways including research findings, logic, expert opinion, and norm-referenced data (e.g., averages, percentiles, etc.).

Well-known health-related criterion-referenced fitness tests designed for a national audience have included **Physical Best** and **FITNESSGRAM**. In the mid 1990's, the American Alliance for Health, Physical Education, Recreation and Dance adopted the **Prudential FITNESSGRAM** (Cooper Institute for Aerobics Research, 1992) as its only recommended test of physical fitness. Although the **Prudential FITNESSGRAM** manual contained a section on special populations, different or modified test items and/or standards were not presented in any systemic way for youngsters with specific disabilities.

In 1993 the U.S. Department of Education funded Project Target, a research study primarily designed to develop a health-related criterion-referenced physical fitness test for youngsters (aged 10-17) with disabilities. Specifically, the purpose was to recommend test items and standards for youngsters with mental retardation, spinal cord injury, cerebral palsy, blindness, congenital anomaly and amputations. A total of 1,542 youngsters with and without disabilities were tested and data associated with several projects including thousands of youngsters were analyzed as a part of Project Target. The project was centered at the State University of New York, College at Brockport. The Brockport Physical Fitness Test (BPFT) is the result of activities associated with Project Target.

A number of unique elements are associated with the Brockport Physical Fitness test. First, it represents an initial attempt to apply the health-related criterion-referenced fitness approach to youngsters with disabilities. Second, it recognizes the individualized nature of fitness testing and encourages a personalized approach based on health-related needs and a desired fitness profile. Third, in an effort to provide options for teachers attempting to "personalize," the battery includes several different fitness tests from which to choose. However, a complete battery for one individual generally includes four to six items. Finally, some of the test items are new (or at least nontraditional) and designed to include a larger number of youngsters in the testing program than previously was possible.

As fitness testing manuals go, this one is pretty thick. Most of the pages are dedicated to directions for individual test items found in the latter part of the book. Testers should also become familiar, however, with the front matter. Understanding the rationale for the test (along with its strengths and weaknesses) is important in interpreting results. The first chapter of the manual includes information on definitions and classifications for target populations covered by the test. The second chapter provides the conceptual framework for the test and includes information on personalization and the bases for various criterion-referenced standards. A chapter on using the manual is presented next. The fourth chapter includes profiles, test selection guides, and standards recommended for the various populations. The fifth chapter contains descriptions for all test items and the final chapter relates to testing youngsters with more severe disabilities.

Test Construction

There are 27 test items associated with the Brockport Physical Fitness Test. However, generally only 4 to 6 need to be selected to assess the health-related physical fitness of a youngster. As one might expect, considerable study was undertaken to determine the test items to be recommended in the test and the standards which would be used to evaluate physical fitness.

The process developed to select test items and standards for youngsters reflects the personalized approach described in detail in Chapter II. The steps basically include identifying and selecting health-related concerns of importance for a youngster, establishing a desired personalized fitness profile, selecting components and subcomponents of physical fitness to be assessed, selecting test items to measure the selected components, and selecting health-related standards to evaluate physical fitness.

A major criterion for the selection of test items and standards for the BPFT was validity. In this regard it was necessary to establish a framework for health-related physical fitness. Once this framework was determined, test items and standards were selected on the basis of logic, a review of literature and data deemed relevant to validity. The theoretical conceptual basis for the test and other information regarding domain-referenced validity is discussed within this manual in Chapter II to the extent necessary to appropriately interpret results of testing. More detailed information on validity is not presented in this manual because of space limitations and a decision to publish it elsewhere. The source of this information may be obtained by reviewing the literature and/or contacting the authors of this manual.

A second criterion for selection of test items was reliability. All the test items recommended in connection with the text are believed to be reliable. Much data were found in the literature in regard to the reliability of test items and additional data supporting test item reliability were collected as part of Project Target. Again, readers may obtain this information in the literature and/or by contacting the authors of this manual.

A third criterion for the selection of test items and standards was the extent to which test items could be used for different classes of youngsters. Preference was given to test items and standards which would be applied to nondisabled youngsters as well as youngsters with disabilities and found in appropriate tests of physical fitness designed for the general population. In particular, test items associated with the Prudential FITNESSGRAM were selected so that the BPFT could be easily coordinated by users of that test. In selecting test items, preference was also given to those items that could be administered to both males and females, to youngsters at various ages between 10 and 17, and youngsters with various disabilities.

The fourth criterion of primary importance in the selection of test items was to select test items of physical fitness which were believed to measure different traits or abilities but which encompassed the orientation of physical fitness used for this test. This was done so that each item in the test added new information about the ability of the youngster.

Additional secondary criteria were also analyzed in the selection of test items. To the extent possible, test items selected were reasonably familiar to physical educators, economical in terms of time and expense, and feasibly administered in field situations.

Target Populations

The Brockport Physical Fitness Test may be used by both youngsters with and without disabilities. As a part of Project Target it was particularly developed for use with youngsters with disabilities. However, a health-related criterion-referenced test for persons with disabilities builds upon and closely relates to the physical fitness of youngsters in the general population. Although the process associated with test development used in this manual may be applied to a variety of youngsters with disabilities, it has been applied and is presented in detail for youngsters with visual impairments, mental retardation, and orthopedic impairments including cerebral palsy, spinal cord injuries, congenital anomalies and amputations. Definitions and classifications associated with these target groups are presented in the following paragraphs.

General Population

General population youngsters include those without disabilities. They are free from impairments or disabilities which influence test results.

Youngsters with Mental Retardation

In view of the continual change in terminology and definitions concerned with mental retardation it is necessary to clarify the meaning of mental retardation and its relationship to physical fitness

for purposes of this test. In accordance with the American Association on Mental Retardation (1992):

> Mental retardation refers to substantial limitations in present functioning. It is characterized by significantly subaverage intellectual functioning, existing concurrently with related limitations in two or more of the following applicable adaptive skill areas: communication, self-care, home living, social skills, community use, self-direction, health and safety, functional academics, leisure, and work. Mental retardation manifests before age 18.

Although most youngsters with mental retardation should have no limitations in physical fitness, others with mental retardation may exhibit limitations ranging from mild to severe. They may require slight to marked modifications in testing to measure physical fitness.

Youngsters with mental retardation and mild limitations in physical fitness include persons requiring intermittent or limited support in learning and/or performing test items which result in substantial adjustments to or alternative test items and/or standards to measure and evaluate one or more components of physical fitness. These individuals are capable of levels of fitness consistent with positive health which enable them to participate in games and leisure activities in selected appropriate environments, and to perform activities of daily living. Youngsters with mental retardation with mild limitations are perhaps best associated with the lower levels of mild mental retardation and moderate mental retardation classification formerly associated with classifications of the American Association on Mental Retardation.

Youngsters with mental retardation who have severe limitations generally have a need for extensive or pervasive support related to physical fitness. They require marked help in learning and performing physical fitness test items. They need alternative test items and/or marked modifications in measuring one or more components of physical fitness. Valid assessment of physical fitness of this group using typical health-related physical fitness tests may not be possible. Measurement of physical activity may be preferred for this group rather than assessment using physical fitness test items designed for nondisabled persons which typically place an individual on a health-related achievement scale. Task analyzed test items may be suitable as test items of physical fitness for this group and physical assistance may often be required as these test items are performed. Table 1.1 summarizes limitations and needs related to physical fitness testing of youngsters with mental retardation.

Table 1.1
Limitations and Needs Related to the Physical Fitness Testing of Youngsters with Mental Retardation

Limitation	Needs
None	Have no unique physical fitness needs and require no unique modification or support in learning and performing physical fitness tests. The desired physical fitness profile and standards to evaluate physical fitness are identical to those used by youngsters without disabilities.
Mild	Pursue a desired physical fitness profile leading toward or closely related to that of nondisabled persons and able to demonstrate physical fitness on a health-related achievement scale. Reflect mild limitations in physical fitness requiring intermittent or limited support in learning and/or performing test items; may require substantial adjustments to test items or alternative test items to measure one or more components of physical fitness; adjusted standards for assessing physical fitness may be appropriate.
Severe	Because of severe limitations, need extensive or pervasive support in learning and performing test items; need alternative test items or marked modifications in measuring one or more components of physical fitness; valid assessment of physical fitness using test items designed to place individuals on a health-related achievement scale may not be possible; may require assessment involving physical activity rather than physical fitness; generally need individualized criterion-referenced standards relative to assessment of physical fitness.

Youngsters with Visual Impairment

Visual impairment, including blindness, is defined as an impairment in vision that, even with correction, adversely affects a child's educational performance. The term includes both partial sight and blindness. Categories of blindness which follow, are consistent with those used by the United States Association for Blind Athletes. The category related to partial sightedness is an added category used in connection with this test.

B1 Totally blind; may possess light perception but unable to recognize hand shapes at any distance.

B2 Those perceiving hand shapes but with visual acuity of not better than 20/600 and/or those with less than 5 degrees in the visual field.

B3 Those with visual acuity from 20/599 through 20/200 and/or those with more than 5 degrees through 20 degrees in visual field.

PS Partially sighted; those with visual acuity from 20/199 through 20/70.

Youngsters with Orthopedic Disabilities

Spinal Cord Injury (SCI)

For purposes of The Brockport Physical Fitness Test, a spinal cord injury is a condition which involves damage to the spinal cord resulting in motor and possibly sensory and muscular impairment. It includes traumatic as well as congenital spinal cord injury or malfunction. Level and extent of damage affects nature and degree of impairment and disability. A complete spinal cord injury results in total loss of sensory, motor, and autonomic functions below the neurological level of spinal cord damage. An incomplete injury results in a portion but not total loss of function below the level of injury. The Brockport Physical Fitness Test for individuals with spinal cord injury includes test items for individuals who have low level quadriplegia, or paraplegia and who primarily use wheelchairs for locomotion in their activities of daily living. It also may be used for ambulatory youngsters with SCI.

To select test items and standards appropriately for measurement and evaluation of physical fitness, the Brockport Physical Fitness Test uses a three-category classification related to an individual with spinal cord injury. The classification includes the categories of low level quadriplegia (LLQ), paraplegia - wheelchair (PW), and paraplegia - ambulatory (PA). These categories are summarized in Table 1.2.

Cerebral Palsy

The Brockport Physical Fitness Test has adopted the definition and classification system of the Cerebral Palsy International Sport and Recreation Association (CP-ISRA):

> Cerebral Palsy is a brain lesion which is non-progressive and causes variable impairment of the coordination, tone and strength of muscle action with the resulting inability of the person to maintain normal postures and perform normal movements (CP-ISRA, 1993).

In an effort to describe the degree of impairment, as it influences performance in physical activity and sport, CP-ISRA has developed a classification system which is based on a functional evaluation that includes an assessment of the extent of control of the lower extremity, trunk,

upper extremity, and hand. This classification system is summarized below. Class 1 includes those individuals with the most severe involvement (e.g., dependent on electric wheelchair or assistance for mobility), while Class 8, the highest class, includes those who are minimally affected (e.g., runs and jumps freely). The first four classes are appropriate for those who use wheelchairs and the second four are used to classify those who are ambulatory.

Table 1.2
Classification System
for Youngsters with Spinal Cord Injury (SCI)

Category	Description
Low Level Quadriplegia (LLQ)	Includes individuals with complete or incomplete spinal cord damage that results in neurological impairment of all four extremities and the trunk. It includes individuals with lower cervical (C6-C8) neurological involvement.
Paraplegia - Wheelchair (PW)	Includes individuals with complete or incomplete spinal cord injury below the cervical area resulting in motor loss in the lower extremities (paraplegia) and the need to use wheelchairs for daily living activities.
Paraplegia - Ambulatory (PA)	Includes individuals with complete or incomplete spinal injury resulting in motor loss in the lower extremities but who ambulate in daily activities without the use of wheelchair assistance.

Congenital Anomalies and Amputations (CA/A)

For the purposes of the project, individuals with congenital anomalies include youngsters with fully or partially deformed extremities at birth. Individuals with amputations refer to persons who have part or all of one or more of their extremities missing. Amputations may be congenital or acquired. The classification system, tests, and standards associated with the Brockport Physical Fitness Test assume that persons are nondisabled except for their amputations or congenital anomalies. Individuals who have physical conditions or diseases in addition to congenital anomalies/amputations must have programs more specifically personalized for them with medical consultation.

In the Brockport Physical Fitness Test, individuals are subclassified according to limb involvement (e.g., one arm only, two legs only, etc.). The specific location of limb involvement (e.g., right arm above elbow), however, is not typically a factor in subclassification.

Table 1.3
Classification System for Individuals with Cerebral Palsy*

Category	Description
Class 1	Severe spastic quadriplegia with or without athetosis or with poor functional range of movement and poor functional strength in all extremities and trunk; or severe athetoid quadriplegia with or without spasticity with poor functional strength and control. In either case, dependent on electric wheelchair or assistance for mobility. Unable to functionally propel a manual wheelchair.
Class 2	Severe to moderate spastic quadriplegia with or without athetosis; or severe athetoid quadriplegia with fair function in the less affected side. Poor functional strength in all extremities and trunk but able to propel a manual wheelchair. An individual is further classified as 2U if the individual exhibits relatively better upper body abilities than lower body abilities. An individual further classified as 2L exhibits relatively greater lower rather than upper body abilities.
Class 3	Moderate quadriplegia or severe hemiplegia resulting in utilization of a wheelchair for activities of daily living. Can propel a manual wheelchair independently and has almost full functional strength in the dominant upper extremity.
Class 4	Moderate to severe diplegia with good functional strength and minimal limitation or control problems noted in the upper limbs or trunk. A wheelchair is usually choice for sport.
Class 5	Moderate diplegia (or triplegia). The individual may require the use of assistive devices in walking but not necessarily when standing or throwing. Problems with dynamic balance are possible.

Table 1.3 (cont'd)

Class 6	Moderate athetosis or ataxia. Ambulates without aids. Athetosis is the most prevalent factor, although some with spastic quadriplegia (i.e., more arm involvement than in ambulant diplegia), may fit this class. All four limbs will usually show functional involvement in sports movements. Class 6 individuals usually have more control problems in upper limbs than those in Class 5, but usually have better function in lower limbs particularly when running.
Class 7	This class is appropriate for the individual with ambulant hemiplegia. Spasticity exists on one side of the body. Ambulate without assistive devices but often with a limp due to spasticity in a lower limb. Good functional ability on the dominant side of the body.
Class 8	Individuals who are minimally affected by spastic diplegia, spastic hemiplegia, or monoplegia, or who are minimally affected by athetosis or ataxia should be assigned to this class.

*This classification system is based upon the classification system developed by Cerebral Palsy - International Sport and Recreation Association (CP-ISRA).

Chapter II

The Conceptual Framework

The Brockport Physical Fitness Test is a criterion-referenced test of health-related fitness. In a criterion-referenced approach, test scores obtained by youngsters are compared to standards which are thought to be associated with some index of positive health. It is important that test users understand the bases for these standards when assessing a youngster's performance.

The framework for developing the Brockport Physical Fitness Test is represented by Figure 1. This schematic, which is modified from a model described by Bouchard and Shephard (1994), should be helpful in understanding how test items and standards were selected. Relationships among physical activity, health-related physical fitness, and health depicted in the paradigm are discussed in the following paragraphs.

Physical Activity

Physical activity consists of any bodily movement produced by skeletal muscle resulting in a substantial increase over resting energy expenditure (Bouchard & Shephard, 1994). Although categories of physical activity can also include work and domestic chores (Shephard, 1994), the Brockport approach focuses on two categories, physical education and leisure time activity. Subsets of these two categories are shown in the schematic. exercise, sport, training, dance, and play. These types of physical activity can be performed in different "patterns" as dictated by frequency, intensity, and duration variables. In the Brockport approach, the primary role of physical activity is related to the conditioning benefit it provides in developing health-related physical fitness.

Health

Health has been defined as a "human condition with physical, social, and psychological dimensions, each characterized on a continuum with positive and negative poles. Positive health is associated with a capacity to enjoy life and to withstand challenges; it is not merely the absence of disease. Negative health is associated with morbidity and, in the extreme, with premature mortality" (Bouchard & Shephard, 1994 p.84). In the Brockport paradigm, health is conceived of consisting of two general constructs, physiological health and functional health. Physiological health is related to organic well-being of the individual. Indices of physiological health include traits or capacities that are associated with well-being, absence of a disease or condition, or low risk of developing a disease or a condition. Appropriate levels of body composition and aerobic capacity are examples of indices of good physiological health.

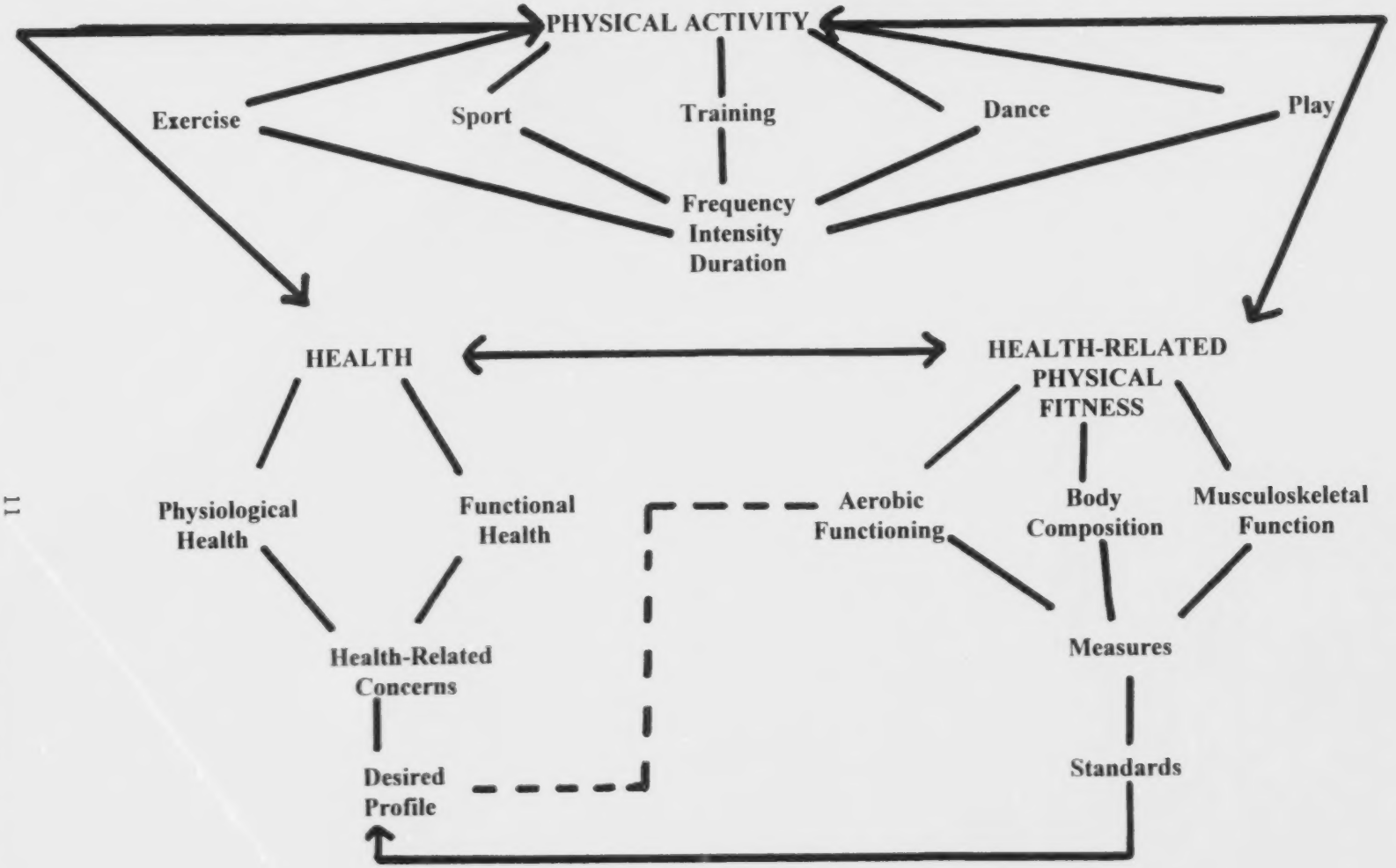

Figure 2.1: Relationships Among Health, Physical Activity and Health-Related Physical Fitness

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Functional health is related to physical capability of the individual. Indices of functional health include the ability to perform important tasks independently, and the ability to independently sustain the performance of those tasks. Ability to perform activities of daily living (ADLs), ability to sustain physical activity, and ability to participate in leisure activities are examples of indices of good functional health. Both physiological health and functional health contribute to ones capacity to enjoy life and to withstand challenges; both provide indices of health that serve as bases for health-related physical fitness standards.

Health-Related Physical Fitness

The Brockport definition of health-related physical fitness is as follows:

> Health-related fitness refers to those components of fitness that are affected by habitual physical activity and relate to health status. It is defined as a state characterized by (a) an ability to perform and sustain daily activities and (b) demonstration of traits or capacities that are associated with a low risk of premature development of diseases and conditions related to movement (modified from Pate, 1988).

The health-related components of fitness adopted for this test include aerobic functioning, body composition, and musculoskeletal functioning. Aerobic functioning is a term that encompasses both aerobic capacity (maximum oxygen uptake) and the ability to perform aerobic activity at specified levels of intensity and duration. Body composition provides an indication of the degree of leanness/fatness of the body (usually percent body fat). Musculoskeletal functioning is a component that combines measures of muscular strength, muscular endurance, and flexibility/range of motion. Combining these elements speaks to their relationship especially when programming. Improving range of motion of a joint in a youngster with a disability, for instance, may require improving the extensibility of the agonistic muscle while improving the strength of the antagonistic muscle. The Brockport definition of health-related physical fitness is consistent with the definition of physical fitness advanced by Caspersen, Powell, & Christenson (1988). These authors indicate that physical fitness is a set of attributes that people have or achieve that relate to the ability to perform physical activity.

A Personalized Approach

Field based norm-referenced or criterion-referenced tests of physical fitness which have been developed and used with youngsters in the past few years have exhibited several identifiable characteristics. Important here is the fact that they have been developed to a great extent on an assumed commonality regarding factors such as physical fitness purposes, needs, test items, and standards. Typically, individualization within tests has been limited to and focused upon age and gender considerations. Thus, tests which have been developed have typically consisted of a

standard number of test items which are performed in a specific way and are evaluated using a general population standard. Also, tests have usually been developed for youngsters rather than with youngsters.

Although tests described clearly have value for the typical hypothetical youngster, they also clearly have limited value for youngsters with disabilities. In regard to health-related tests of physical fitness, health-related concerns of youngsters with disabilities exceed, as well as differ, from youngsters in the general population. Specific disabilities may affect movement modes, movement abilities, and health-related physical fitness potential. For example, individuals completely paralyzed in the lower extremities using a wheelchair are unable to demonstrate aerobic functioning by running a mile. A different way of demonstrating and assessing aerobic functioning is necessary in such an instance. An individual with double leg amputation at or near the hip-joint will require different maximum oxygen intake or body mass index standards to validly evaluate fitness than nondisabled peers. Perhaps test items to measure physical fitness should be different for youngsters with these disabilities. Perhaps health-related concerns and subcomponents of physical fitness need to be modified or be different than those selected for nondisabled peers. Because of the wide variation in needs and abilities of youngsters with disabilities, specific nature of a physical fitness test should be developed with personal association and interaction with youngsters being served to the extent possible. When this occurs, the test becomes personalized as well as individualized. These concepts have not traditionally played an important role in the development of physical fitness tests.

Because of the many problems cited above, the Brockport Physical Fitness Test (BPFT) has incorporated a personalized approach regarding physical fitness testing and assessment. Following development of an orientation to health-related criterion-referenced physical fitness and a corresponding definition of physical fitness, the following steps are suggested for personalizing a health-related, criterion-referenced physical fitness test:

- Identify and select health-related concerns of importance to the youngster.
- Establish a desired personalized fitness profile with (or for, as necessary) the youngster.
- Select components and subcomponents of physical fitness to be assessed.
- Select test items to measure selected fitness components and subcomponents.
- Select health-related criterion-referenced standards to evaluate physical fitness.

Each of these steps is discussed below.

Health-Related Concerns

Following acceptance of a given orientation to health-related physical fitness, the first step in development of a personalized physical fitness test for a person or class of persons is to identify and select health-related concerns which the test will address and/or emphasize. In practice, health concerns of the general population are reviewed to determine if they are appropriate for individuals with disabilities. These concerns provide bases for use of criterion-referenced

standards where health status is used as the criterion. For example, the developers of Prudential FITNESSGRAM identified health-related concerns related to the test. Health-related concerns associated with the Prudential FITNESSGRAM include high blood pressure, coronary heart disease, obesity, diabetes, some forms of cancer, lower back flexibility, functional health, and other health problems. These may also serve as the basic concerns of individuals with disabilities. However, individuals with disabilities may also have additional health-related concerns regarding their health status. For example, a youngster with a spinal cord injury requiring a wheelchair for ambulation may select health-related concerns typical of nondisabled youngsters. Additional concerns for this individual may include the ability to sustain aerobic activity; flexibility/range of motion of the hips and/or the upper body; strength and endurance to lift and transfer the body independently, lift the body to prevent decubitus ulcers, or propel a wheelchair manually. Health-related concerns such as these may be drawn from professional literature, expert opinions, opinions of parents and youngsters themselves, or other sources deemed appropriate. The key is to identify and select health-related concerns most relevant and important to the individual.

Desired Personalized Profile

Once health-related concerns are identified, a desired personalized physical fitness profile is developed for a person or class of persons. A desired profile establishes the direction or broad goal for a health-related physical fitness program. A profile statement may be written which implicitly or explicitly identifies components of physical fitness which will be addressed and expresses underlying value of the component in regard to the health-related concerns. The profile, thus, serves as a reference for a personalized and/or desired state of physical fitness. If appropriate, the profile serves as a basis for selection of test items and standards for evaluation of health-related physical fitness. Desired profiles at least, should reflect minimal acceptable levels of physical fitness. However, they may also reflect preferred levels. The following sentence reflects a possible desired physical fitness profile for nondisabled youngsters.

> Males and females should, at minimum, possess levels of aerobic capacity and body composition consistent with positive health, flexibility for functional health (especially good functioning of the lower and upper back), and levels of abdominal, trunk extensor, and upper body strength and endurance adequate for independent living and participation in physical activities.

Analysis of health-related concerns and needs of the individual with a spinal cord injury suggests an alternative profile. A possibility appears below.

> Individuals with spinal cord injury should, at minimum, possess a physical fitness profile which promotes levels of aerobic behavior and body composition consistent with positive health; levels of flexibility and range of motion to perform activities of daily living and inhibit contractures; levels of muscular strength and endurance of

wheelchair users to lift and transfer the body, and propel a wheelchair; muscular strength and endurance to counteract muscular weakness, and fitness levels needed to enhance the performance of daily living activities (including sport activities).

Analysis of the two profiles presented above reflects both similar and dissimilar entries. Both profiles reflect a desire for appropriate levels of aerobic functioning. However, the profile for the individual with SCI focuses upon a desired level of aerobic behavior consistent with positive health, whereas the profile for the nondisabled youngster focuses upon appropriate levels of aerobic capacity. The two profiles are identical in regard to desired levels of body composition.

Both profiles identify the importance of musculoskeletal functioning for independent living and participation in physical activities. The profiles differ in regard to specific musculoskeletal needs of the individuals.

Components of Physical Fitness

Components of physical fitness associated with the BPFT include aerobic functioning, body composition, and musculoskeletal functioning. Each of these may include specific subcomponents or areas which may be selected for a personalized physical fitness test. For example, in regard to aerobic functioning, aerobic capacity and/or aerobic behavior may be selected for a personalized physical fitness test. Subcomponents of body composition may include percent body fat or relationship of weight and height. Musculoskeletal functioning may include components of muscular strength and/or muscular endurance and flexibility/range of motion. Components and more specific subcomponents to be included on a personalized test should be consistent and in accord with the desired profile associated with persons or classes of persons. The Brockport Physical Fitness Test recommends that all three components of physical fitness be included in every personalized test of physical fitness to the extent possible.

Test Items, Validity, and Reliability

Once components and subcomponents of health-related physical fitness are selected in consideration of health-related concerns, test items are selected to measure them. Validity, reliability, the extent of use for different classes of youngsters, the extent of information provided by a test item, economy of time and expense, user friendliness, and feasibility in field situations are among the criteria for the selection of test items.

A total of 27 test items are included in the BPFT. Selection guides are provided to help testers select those tests which might be most appropriate for a youngster with a particular disability. Each test is listed in the following table along with its associated component or sub-component of fitness, target populations for the selected test item, and a summary of available validity and reliability information. References are provided where appropriate. Readers are referred to the

BPFT Technical Manual (Short and Winnick, 1999) for more detailed information on validity and reliability as well as background on the selection and attainability of standards. The Technical Manual is available as part of the software package that accompanies this test manual. [Readers also may wish to consult the Project Target Final Report (Winnick and Short, 1998) for information on validity and reliability.]

Essentially three different types of validity are claimed for the various test items: concurrent, construct, and logical (or content). Where an item has concurrent validity it has a relationship with some criterion measure of the component/sub-component of fitness being measured (eg. VO_2max, percent body fat). Evidence of concurrent validity is provided for the 20m PACER, 16m PACER, one-mile run/walk, skinfolds, body mass index, and dumbbell press. In most cases correlations with the criterion measure could be considered to be at least moderate (most r's = .70-.89).

Construct validity may be claimed when a test item "loads" with related items in a factor analysis; these related items statistically and logically define a "construct" (eg. strength, body composition, etc) and each item that defines a construct can be used to measure it. Construct validity is used to support, at least in part, the pull-up, grip strength, and flexed arm hang. Earlier factor analytic work by Winnick and Short (1982) established that grip strength is a test that can help define a factor comprised of items requiring strength applied over a short time interval. Pull-ups and flexed arm hang typically loaded on a different factor, one that appeared to have a greater endurance component. All three items, therefore, seem to appropriately measure "upper body strength/endurance" (where "upper body" has been determined logically).

Logical validity is claimed for most of the items in the BPFT battery. In each case a rationale exists for relating a test item to some important criterion behavior. Sometimes the rationale is anatomical (eg. the curl-up test measures the strength/endurance of the abdominal muscles; the Thomas test measures the length of the hip flexors; the back saver sit and reach assesses the flexibility of the hamstrings) and other times it is functional (eg. the wheelchair ramp test evaluates the ability to negotiate a one-step standard incline; the 40m push/walk tests the ability to achieve a "functional" speed for community mobility), but in each case the test purports to measure an aspect of fitness with health-related implications. Although the Technical Manual is the best place to find more information on logical validity, the section on "The Bases for the Standards" in this manual provides some additional material that should be helpful to the reader. Whether established statistically or logically, evidence of validity is provided for each item in BPFT.

A variety of statistics are used to demonstrate reliability on a test-retest basis. The interclass r (the Pearson product-moment coefficient), the intraclass R, and Cronbach's alpha (a) all have been used to estimate the reliability of test items in the BPFT. The intraclass R and Cronbach's alpha are preferred measures of reliability because they account for more sources of measurement error than does the interclass r. Proportion of agreement (P) is a reliability estimate of a criterion-referenced test and provides information on the consistency of pass/fail decisions over

Table 2.1
A Summary of Test Item
Validity and Reliability

Test Item	Component/ Sub-component	Target Population	Validity	Reliability
Pacer (20m)	Aerobic capacity	GP, MR, BL, CA/A	High content; moderate concurrent (Cureton, 1994a)	r = .89 (GP) (Leger, et al., 1988) a = .97 (MR) (Short & Winnick, 1999)
Pacer (16m)	Aerobic capacity	MR	r = .77 with peak VO_2 (MR) (Fernhall, et al., 1998)	a = .96-.98 (MR) (Short & Winnick, 1999)
One-Mile Run	Aerobic capacity	GP, BL, CA/A	r's = .60-.85 with VO_2 max (Cureton, 1994a)	Usually highly reliable for adolescents (Safrit & Wood, 1995)
Target Aerobic Movement Test (TAMT)	Aerobic behavior	MR, CP, SCI, CA/A	Logical	P = .92 (SCI) (Rimmer, et al., 1997)
Skinfolds	Body composition	All	r's = .88-.89 with percent body fat (Lohman, 1994)	Interrater reliability is high (coefs. >.95) (Safrit & Wood, 1995)
Body Mass Index (BMI)	Body composition	GP, MR, BL, CP	r's = .70-.82 with percent body fat (Lohman, 1992)	Very high (Lohman, 1994)
Reverse Curl	Upper body strength/end.	SCI	Logical	No data available
Seated Push-up	Upper body strength/end.	CP, SCI, CA/A	Logical	No data available
40m Push/Walk	Upper body * strength/end.	CP	Logical	No data available

* 40m Walk is a general strength/endurance item.

Table 2,1 (cont'd)

Wheelchair Ramp Test	Upper body strength/end.	CP	Logical	No data available
Push-up	Upper body strength/end.	GP, BL	Logical (Plowman & Corbin, 1994)	Generally reliable (coefs. = .60-.96) (Plowman & Corbin, 1994)
Pull-up	Upper body strength/end.	GP, BL, CA/A	Logical (Plowman & Corbin, 1994); Construct (Winnick & Short, 1982)	Generally reliable (coefs. = .79-.91) (Plowman & Corbin, 1994)
Mod.Pull-up	Upper body strength/end.	GP, BL	Logical (Plowman & Corbin, 1994)	Generally reliable (coefs. = .56-.91) (Plowman & Corbin, 1994)
Dumbbell Press	Upper body strength/end.	CP, SCI, CA/A	Logical; r = .81 (GP) with bench press (Short & Winnick, 1999)	a = .98 (MR) (Short & Winnick, 1999)
Bench Press	Upper body strength/end.	MR, SCI, CA/A	Logical	a = .91(MR) - .92(GP) (Short & Winnick, 1999)
Grip Strength	Upper body strength/end.	MR, CP, SCI, CA/A	Construct (Winnick & Short, 1982); Logical	Most coefs. in the .90's (Safrit & Wood, 1995)
Isometric Push-up	Upper body strength/end.	MR	Logical	R = .83 (Eichstaedt & Lavay, 1992) a = .83 (MR) (Short & Winnick, 1999)
Extended Arm Hang	Upper body strength/end.	MR	Logical	a = .85 (MR) (Short & Winnick, 1999)
Flexed Arm Hang	Upper body strength/end.	GP, MR, BL, CA/A	Construct (Winnick & Short, 1982); Logical (Plowman & Corbin, 1994)	a = .84-.96 (Daquila, 1982) a = .93 (MR) (Short & Winnick, 1999)
Trunk Lift	Trunk/abdom. function	GP, MR, BL, CA/A	Logical (Plowman & Corbin, 1994)	P = .89 (MR) (Short & Winnick, 1999)

Table 2.1 (cont'd)

Curl-up	Trunk/abdom. function	GP, BL, CA/A	Logical (Plowman & Corbin, 1994)	R's = .93-.97 (Robertson & Magnusdottir, 1987)
Mod. Curl-up	Trunk/abdom. function	MR	Logical (Jette, et al., 1984)	r = .88 (Jette, et al., 1984) a = .82 (Short & Winnick, 1999)
Target Stretch Test	Flexibility/ROM	CP, SCI, CA/A	Logical; P = .85 with goniometry - based scoring (Short & Winnick, 1999)	a = .92 for inter-rater reliability for similar protocol (Short & Winnick, 1999)
Shoulder Stretch	Flexibility/ROM	CP, MR, BL, CA/A	Logical	a = .83-.94 (MR) (Short & Winnick, 1999)
Apley Test (mod.)	Flexibility/ROM	CP, SCI, CA/A	Logical	No data available
Thomas Test (mod.)	Flexibility/ROM	CP, SCI, CA/A	Logical	No data available
Back Saver Sit & Reach	Flexibility/ROM	GP, MR, BL, CA/A	Logical (Plowman &Corbin, 1994)	a = .95-.97 (GP) (Patterson, et al., 1996) a = .95-.96 (MR) (Short & Winnick, 1999)

GP = general population
MR = mental retardation
BL = blindness

CP = cerebral palsy
SCI = spinal cord injury
CA/A = congenital anomaly/amputation

r = interclass reliability coefficient
R = intraclass reliability coefficient

a = Cronbach's alpha coefficient
P = proportion of agreement

two administrations of the test. Generally speaking reliability coefficients greater than .70 are considered minimally acceptable estimates of score consistency. Values in the .90 range usually are considered to indicate a high degree of reliability. Test-retest reliability coefficients associated with BPFT test items generally reflect at least minimal levels of acceptability and several are indicative of items that are highly reliable. Statistics on reliability are unavailable for six items in the battery. Scoring for these items generally seems to be fairly objective which should help to control that source of measurement error. Again, readers are referred to the Technical Manual for more information on test item reliability.

Standards

Once test items have been selected to measure components and subcomponents of physical fitness, standards are selected which serve as a basis for evaluating fitness for a health status orientation. Specific, general, minimal general, and preferred general standards may be selected to assess levels of fitness. Health-related standards relate to the general population (general standard) or to a defined category of persons (specific standard). Interpretations of physical fitness status should be made by evaluating implicit or explicit standards reflected in the desired profile which, in turn, reflects a desired level of health-related physical fitness.

Profiles, Tests and Standards within Components of Physical Fitness

Personalization implies that teachers, once they identify appropriate health-related concerns, can write, in consultation with students, where appropriate, their own physical fitness profiles, select their own test items related to components of health-related fitness, and decide on their own standards. The Brockport Physical Fitness Test provides information on profiles, items, and standards which teachers may adopt for use with their students as appropriate.

The Brockport Physical Fitness Test provides 10 profile statements related to three components of health-related fitness: aerobic functioning, body composition, and musculoskeletal functioning (See Figure 2.2-2.6). The components are separated into two statements each for aerobic functioning and body composition and six for musculoskeletal functioning (four related to strength/endurance and two related to flexibility/range of motion). Test items and standards are recommended for each of the 10 profile statements with the target populations in mind. Teachers can select profiles, tests, and standards from options provided in this test. Teachers always have the latitude to adjust or substitute material as an additional option.

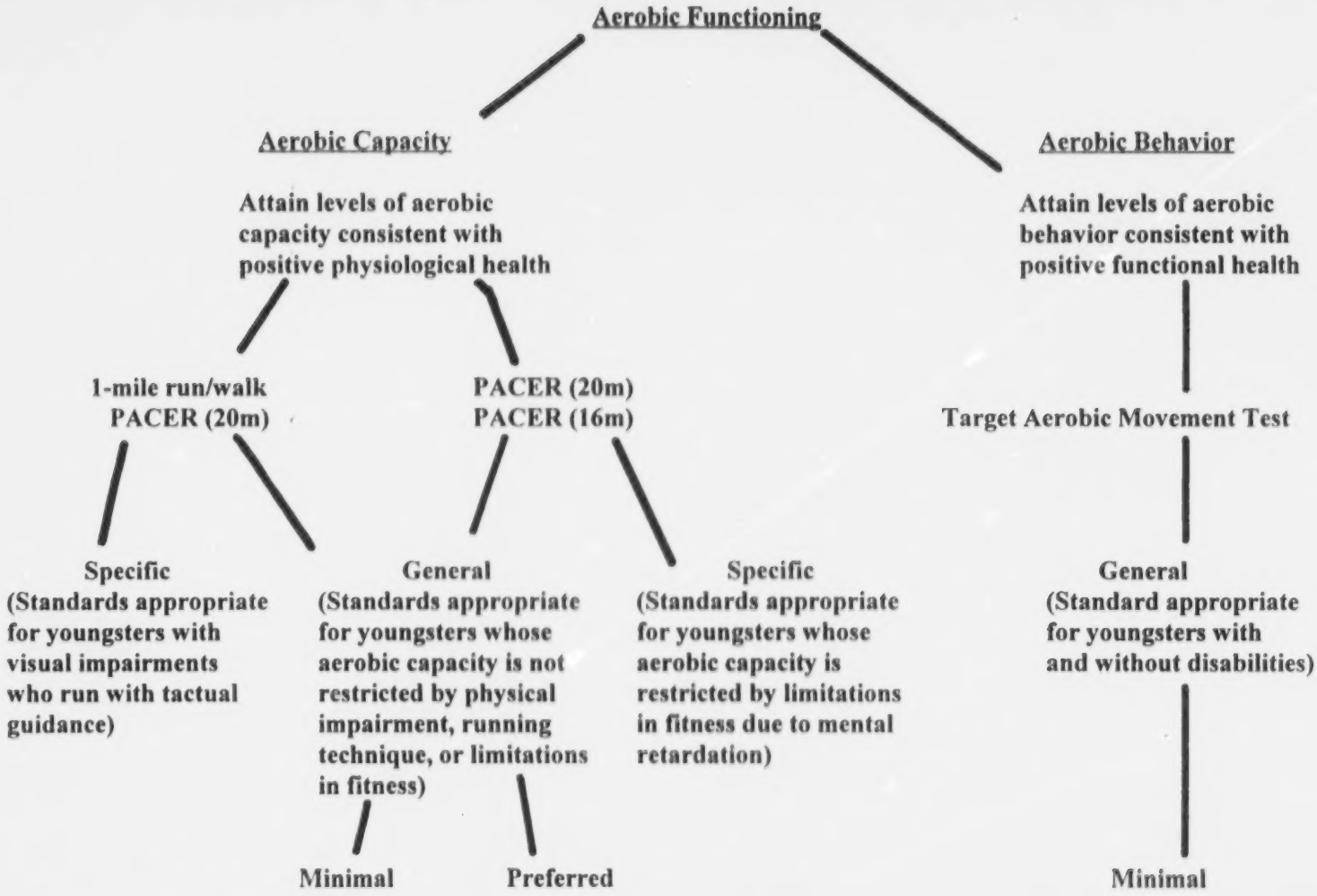
Aerobic Functioning
Aerobic Capacity
Aerobic Behavior
Attain levels of aerobic capacity consistent with positive physiological health
Attain levels of aerobic behavior consistent with positive functional health
1-mile run/walk
PACER (20m)
PACER (20m)
PACER (16m)
Target Aerobic Movement Test
Specific
(Standards appropriate for youngsters with visual impairments who run with tactual guidance)
General
(Standards appropriate for youngsters whose aerobic capacity is not restricted by physical impairment, running technique, or limitations in fitness)
Specific
(Standards appropriate for youngsters whose aerobic capacity is restricted by limitations in fitness due to mental retardation)
General
(Standard appropriate for youngsters with and without disabilities)
Minimal
Preferred
Minimal

Figure 2.2 - Relationships and Standards Related to Aerobic Functioning

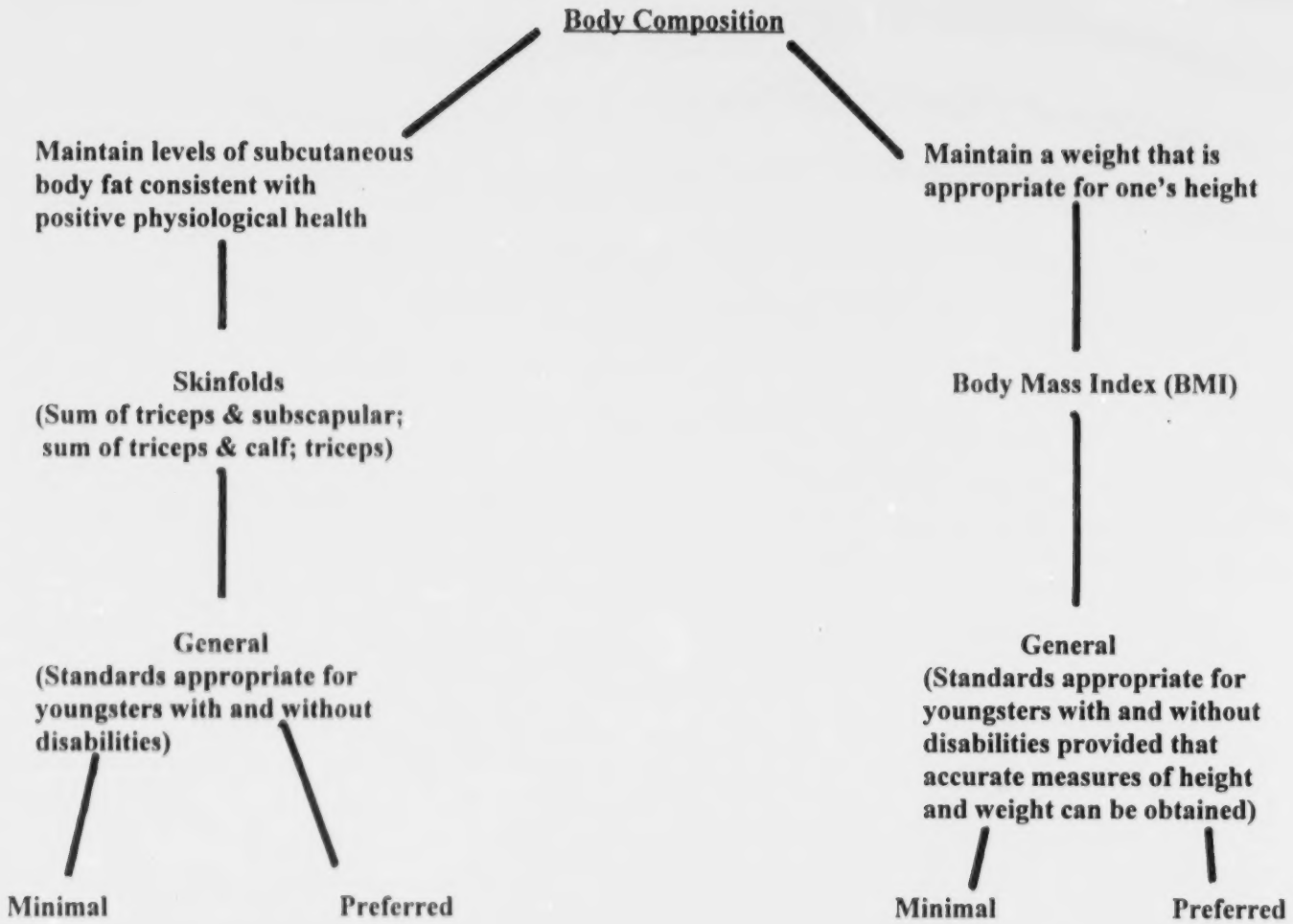
Body Composition
Maintain levels of subcutaneous body fat consistent with positive physiological health
Maintain a weight that is appropriate for one's height
Skinfolds
(Sum of triceps & subscapular; sum of triceps & calf; triceps)
Body Mass Index (BMI)
General
(Standards appropriate for youngsters with and without disabilities)
General
(Standards appropriate for youngsters with and without disabilities provided that accurate measures of height and weight can be obtained)
Minimal
Preferred
Minimal
Preferred

Figure 2.3 - Relationships and Standards Related to Body Composition

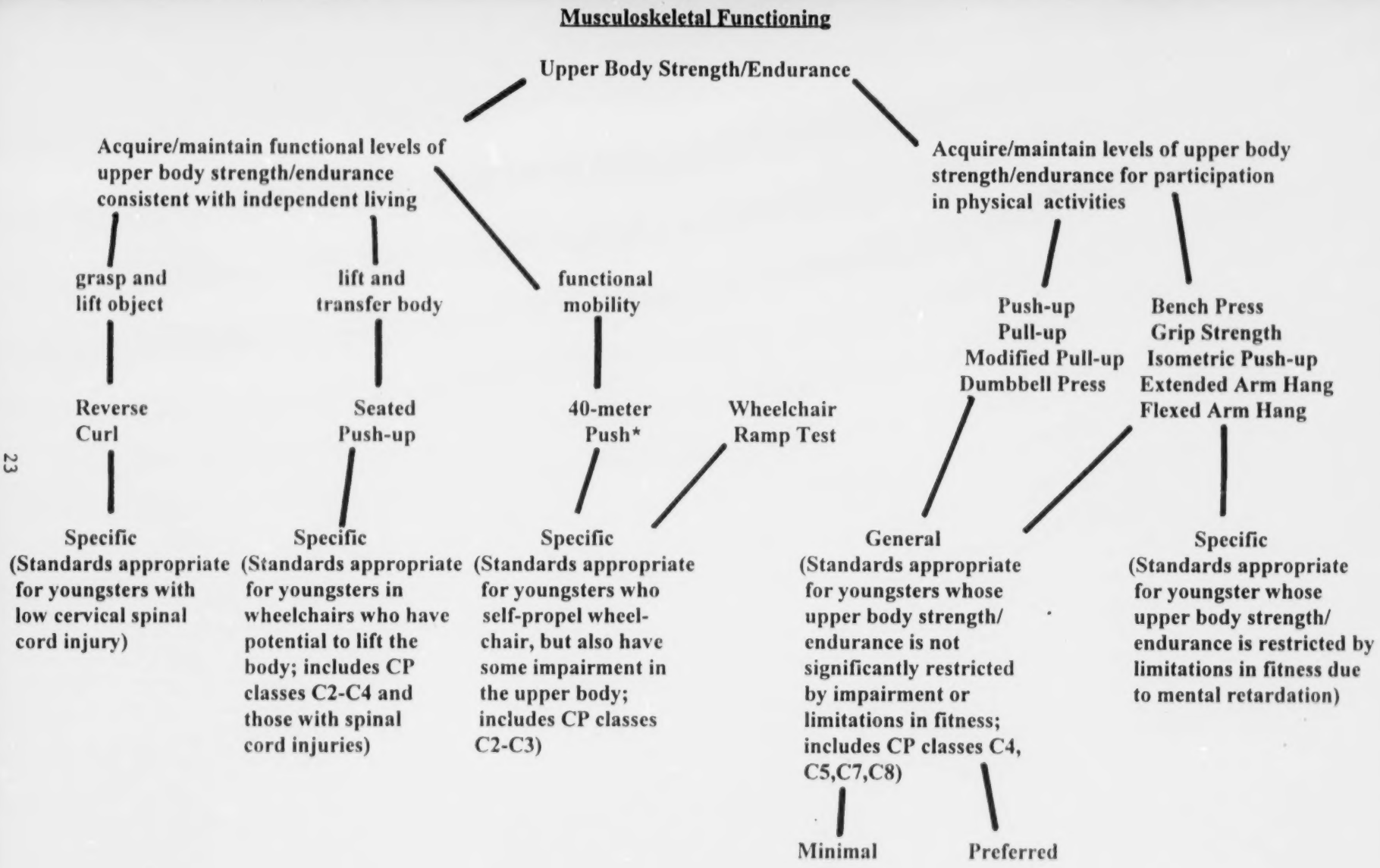
Musculoskeletal Functioning
Upper Body Strength/Endurance
Acquire/maintain functional levels of upper body strength/endurance consistent with independent living
Acquire/maintain levels of upper body strength/endurance for participation in physical activities
grasp and lift object
lift and transfer body
functional mobility
Push-up
Pull-up
Modified Pull-up
Dumbbell Press
Bench Press
Grip Strength
Isometric Push-up
Extended Arm Hang
Flexed Arm Hang
Reverse Curl
Seated Push-up
40-meter Push*
Wheelchair Ramp Test
Specific (Standards appropriate for youngsters with low cervical spinal cord injury)
Specific (Standards appropriate for youngsters in wheelchairs who have potential to lift the body; includes CP classes C2-C4 and those with spinal cord injuries)
Specific (Standards appropriate for youngsters who self-propel wheel-chair, but also have some impairment in the upper body; includes CP classes C2-C3)
General (Standards appropriate for youngsters whose upper body strength/ endurance is not significantly restricted by impairment or limitations in fitness; includes CP classes C4, C5,C7,C8)
Specific (Standards appropriate for youngster whose upper body strength/ endurance is restricted by limitations in fitness due to mental retardation)
Minimal
Preferred
*40m walk is used as a general strength/endurance item

Figure 2.4 - Relationships and Standards Related to Upper Body Strength and Endurance

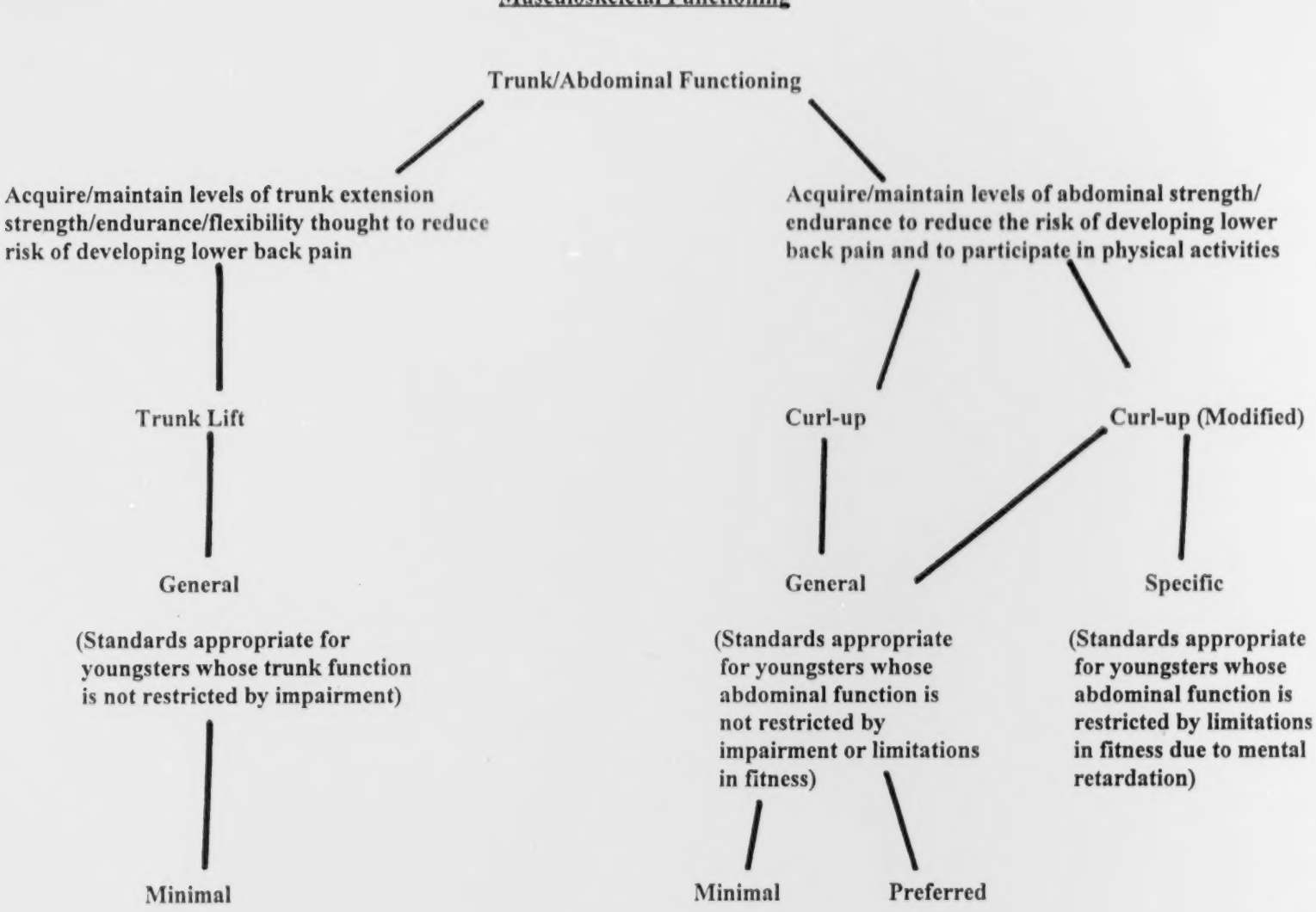
Musculoskeletal Functioning
Trunk/Abdominal Functioning
Acquire/maintain levels of trunk extension strength/endurance/flexibility thought to reduce risk of developing lower back pain
Acquire/maintain levels of abdominal strength/ endurance to reduce the risk of developing lower back pain and to participate in physical activities
Trunk Lift
Curl-up
Curl-up (Modified)
General
General
Specific
(Standards appropriate for youngsters whose trunk function is not restricted by impairment)
(Standards appropriate for youngsters whose abdominal function is not restricted by impairment or limitations in fitness)
(Standards appropriate for youngsters whose abdominal function is restricted by limitations in fitness due to mental retardation)
Minimal
Minimal
Preferred

Figure 2.5 - Relationships and Standards Related to Trunk/Abdominal Functioning

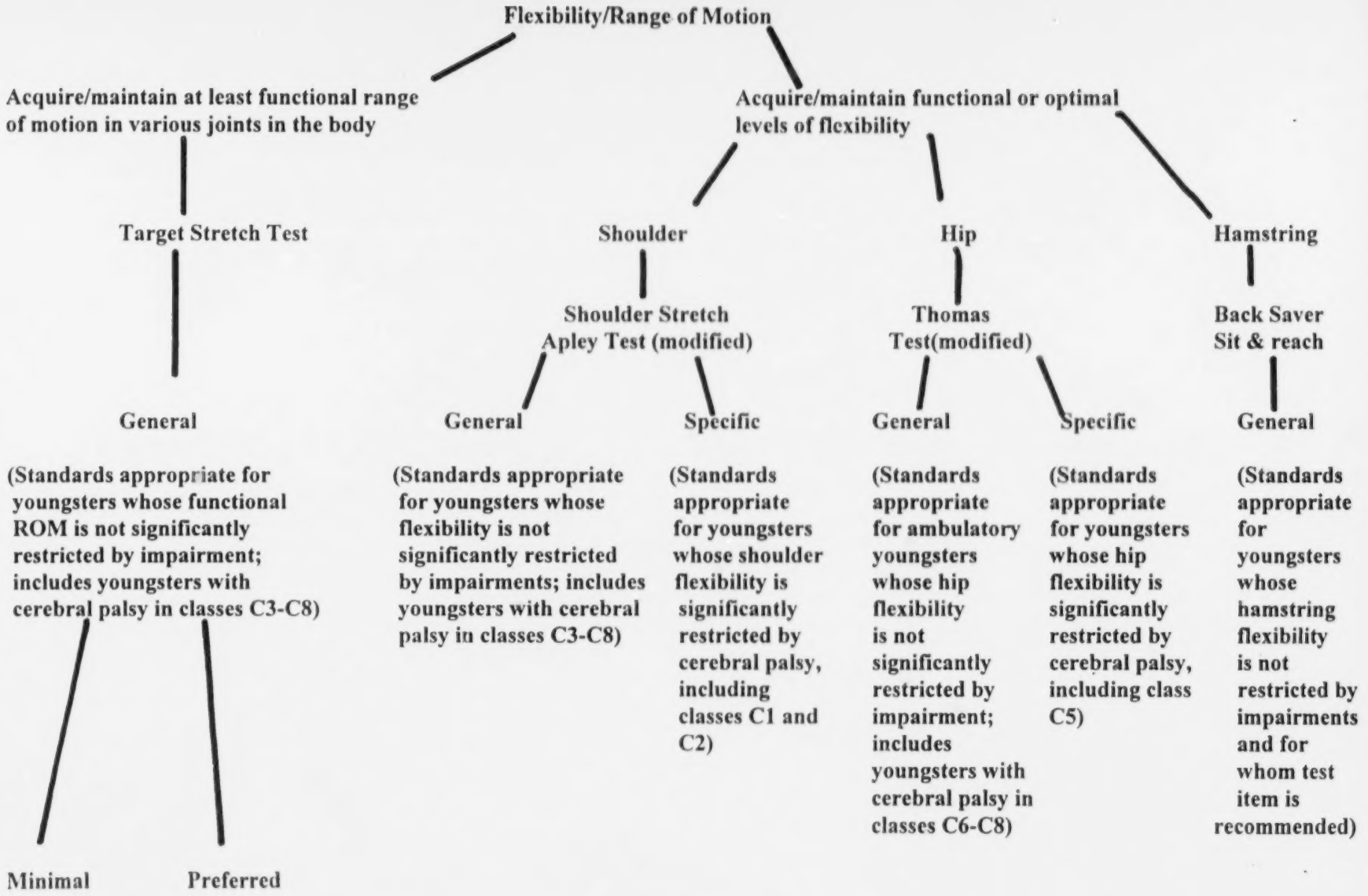
Flexibility/Range of Motion
Acquire/maintain at least functional range of motion in various joints in the body
Acquire/maintain functional or optimal levels of flexibility
Target Stretch Test
Shoulder
Hip
Hamstring
Shoulder Stretch Apley Test (modified)
Thomas Test(modified)
Back Saver Sit & reach
General
General
Specific
General
Specific
General
(Standards appropriate for youngsters whose functional ROM is not significantly restricted by impairment; includes youngsters with cerebral palsy in classes C3-C8)
(Standards appropriate for youngsters whose flexibility is not significantly restricted by impairments; includes youngsters with cerebral palsy in classes C3-C8)
(Standards appropriate for youngsters whose shoulder flexibility is significantly restricted by cerebral palsy, including classes C1 and C2)
(Standards appropriate for ambulatory youngsters whose hip flexibility is not significantly restricted by impairment; includes youngsters with cerebral palsy in classes C6-C8)
(Standards appropriate for youngsters whose hip flexibility is significantly restricted by cerebral palsy, including class C5)
(Standards appropriate for youngsters whose hamstring flexibility is not restricted by impairments and for whom test item is recommended)
Minimal
Preferred

Figure 2.6 - Relationships and Standards Related to Flexibility/Range of Motion

Figures on the previous pages show relationships among fitness components, the 10 profile statements, test items, and standards. Standards are expressed as either general or specific. A general standard is one that is associated with the general population. It is a test score that is related to either functional or physiological health and is attainable by youngsters whose performance is not significantly limited by impairment. A specific standard also reflects functional or physiological health, but it has been adjusted in some way to account for the effects of a specific impairment upon performance. General standards may be recommended for the general population and youngsters with specific disabilities. Specific standards are only provided for selected test items for specific target populations.

If the type of standard is general, teachers will typically have two levels of standards from which to choose, minimal and preferred. A minimal standard is considered to be an acceptable score. It meets the lowest acceptable criterion of health associated with a particular test. Most youngsters should be able to attain the appropriate minimal standard provided. A preferred standard is meant to convey a higher level of fitness and is, therefore, more desirable. A preferred standard represents a good level of fitness, and is one that most youngsters will find challenging. In a few instances a single general standard rather than minimal or preferred general standards is recommended and provided. In such instances, the single standard is associated with a good and preferred level of fitness.

If a standard is either not available for a particular test item or is believed to be inappropriate for a specific youngster, testers are encouraged to develop individualized standards by which to assess performance. An individualized standard is a desired level of attainment for an individual in an area of health status established in consideration of one's present level of performance and expectation for progress. It may not necessarily be a health-related standard.

The Bases for Standards

There are 27 test items associated with the Brockport Physical Fitness Test categorized under three components of health-related fitness. The large number of items provides teachers with greater flexibility when attempting to personalize the test. In most cases teachers will select between 4 and 6 test items to be used with a particular student.

Each of the test items, categorized by fitness component, are identified below. A brief discussion of bases for criterion-referenced standards associated with each item is also provided. Testers need to understand bases for the standards in order to interpret results of testing.

Aerobic Functioning

Aerobic functioning refers to that component of physical fitness that permits one to sustain large muscle, dynamic, moderate to high intensity activity for prolonged periods of time. This

component is dependent primarily on the efficiency or development of heart, lung, blood and skeletal muscle metabolic functions of the body. Aerobic functioning is perhaps the most important of the health-related components of fitness because it has clear relationships with both functional and physiological aspects of health. Possessing an adequate level of aerobic functioning allows one to sustain physical activity for work, play, and emergencies and may reduce risk of developing certain diseases. In the Brockport Physical Fitness Test aerobic functioning has two separate, but related, sub-components: aerobic capacity and aerobic behavior.

Aerobic capacity refers to the highest rate of oxygen that can be consumed by a person while exercising. The more fit a person is, the greater the aerobic capacity. In addition to enhancing performance in endurance activities, acceptable levels of aerobic capacity are associated with the reduced risk of developing certain diseases and conditions in adulthood, including high blood pressure, coronary heart disease, obesity, diabetes, and some forms of cancer (Blair, Kohl, Paffenbarger, Clark, Cooper, & Gibbons, 1989; Blair, Kohl, Gordon, & Paffenbarger, 1992).

A laboratory measure of maximum oxygen uptake is generally considered to be the best measure of aerobic capacity, but aerobic capacity also can be estimated in a field setting. The **PACER** (16m and 20m)and the **One Mile Run/Walk** are test items used to estimate aerobic capacity in the Brockport Physical Fitness Test. Minimal general standards for each of these items are based on a minimal level of VO_{2max} believed to be consistent with positive health and functional capacity for daily living in adult men and women. These VO_{2max} values have been adjusted for age to account for developmental factors (Cureton & Warren, 1990). Preferred standards are based on a level of VO_{2max} which is thought to be good and associated with lower disease risk and mortality in adults (Cureton, 1994a and 1994b). It is believed that some additional health and functional capacity benefits can be attained by meeting the preferred standards.

In the Brockport Physical Fitness Test the aerobic capacity general standards are sometimes adjusted to reflect disability-specific concerns. For instance, youngsters who are blind may need to participate in running items with some form of tactual assistance or guidance (i.e., guide wire, sighted partner). Such an encumbrance will require more energy than running unassisted. Consequently, minimal general standards associated with the one-mile run/walk and the 20m PACER which are based on aerobic capacity values will be lowered somewhat for runners who require tactual assistance to account for the higher energy demands of their activity (See Table 4.14). For those who run with assistance, adjustments in general standards on these items are designated as specific standards which are consistent with the recommendation made by Buell (1983) which called for a 10 percentile adjustment when assessing with norm-referenced standards. Assisted blind runners who attain minimal or preferred general standards likely possess levels of aerobic capacity greater than possessed by youngsters in the general population since inefficiency of running is believed to influence performance. It must be emphasized that VO_{2max} standards are not adjusted for youngsters who are blind.

Youngsters who are mentally retarded may require an adjustment to VO_{2max} standards. In this test, specific standards reflect a lowering of 10 percent in accord with the consistent performance discrepancy which has been observed between youngsters with and without retardation on measures of aerobic capacity. Shephard (1990) estimates that the scores of individuals with mental retardation are 8-12% below those for nondisabled peers of the same age.

In some cases it is not yet possible to estimate aerobic capacity accurately in a field setting. Such an estimate is particularly problematic for those with physical disabilities, especially cerebral palsy. Extent and nature of the impairment, type of wheelchair or other assistive device that may be used, and type of surface on which the test is conducted all contribute to the complexity of the estimate. There is also a belief, shared by the authors, that functional health-related needs regarding aerobic functioning are relevant and important to the individual, and may be more accurately and feasibly measured in field-based tests for persons with disabilities. For these reasons a measure of aerobic capacity is not recommended for certain youngsters with disabilities. Instead it is suggested that a measure of aerobic behavior be administered.

Aerobic behavior refers to ability to sustain physical activity of a specific intensity for a particular duration. The measure of aerobic behavior associated with The Brockport Test is the **Target Aerobic Movement Test** (TAMT). Individuals demonstrating the ability to sustain moderate physical activity for 15 minutes meet the general standard for health-related aerobic behavior. An exercise heart rate of at least 70% of maximum predicted heart rate, adjusted for disability or mode of exercise, represents moderate exercise. The TAMT, therefore, actually has two standards, one for intensity and one for duration.

The ability to sustain at least moderate-level activity for 15 minutes has positive implications for functional health especially for conduct of activities of daily living as well as for participation in leisure time pursuits (including games and sports). Furthermore, this level of activity is believed to reflect behavior, that when performed regularly, is consistent with existing general recommendations for health enhancement or maintenance (ACSM, 1990, 1995; U.S. Department of Health and Human Services, 1996) and is sufficiently intense to stimulate an aerobic training effect (McArdle, Katch, & Katch, 1994).

TAMT is an appropriate test for many youngsters both with and without disabilities. Adjustments to intensity requirements, however, are necessary under certain circumstances. If a youngster uses an arms-only form of exercise (e.g., propelling a wheelchair, cranking an arm ergometer, punching a speedbag) to elevate the heart rate, intensity standards are reduced to account for the fact that maximum predicted heart rate is lower for these forms of exercise (Shephard, 1990). Intensity standards also are adjusted for youngsters who have a spinal cord injury in the low cervical region (C6-C8). These adjustments attempt to account for different ways quadriplegia affects heart rate and provide reasonable expectations for exercise intensity. These adjustments were developed by the Project Target advisory committee.

Body Composition

Body composition is that component of health-related physical fitness which pertains to the degree of leanness/fatness of the body. Body composition has implications for both functional health and physiological health. When fat levels in the body are too high, ability to lift or move the body is negatively affected. Similarly, obesity has been found to be associated with an increased risk of diabetes, coronary heart disease, high blood pressure, arthritis, various forms of cancer, and all-cause mortality (U.S. Department of Health and Human Services, 1996). Several studies have shown that skinfold thicknesses are related to higher levels of blood lipids, lipoproteins, blood pressure, and glucose tolerance in children (Lohman, 1994). Paffenbarger and Lee (1996) identified several studies indicating that obesity is a risk factor in the development of coronary heart disease.

Indicators of body composition in the Brockport Physical Fitness Test are **skinfolds** and **body mass index**. Minimal general standards for body fat are based on a range of 10-25% body fat for males, and 17-32% for females. These percentages reflect minimally acceptable zones of percent body fat. Research indicates that when body fat percentage exceeds the upper values in these ranges, there is an increase in mortality rates from cardiovascular disease (Lohman, 1994). Lower values are meant to convey that a youngster's health also may be negatively affected by low levels of body fatness (Lohman, 1994). The preferred general standards retain the lower percentage body fat values, but reduce the upper values. Preferred general standards, therefore, are based on 10-20% body fat for males and 17-25% for females. These ranges are considered to be optimal for children and adolescents because there is a tendency for youngsters to get fatter with age (Lohman, 1994). It is recommended that skinfold measures only be taken over areas with active muscles. No specific standards are recommended for body composition. Regardless of disability all youngsters need to maintain an appropriate level of body fat for health reasons.

Body mass index (BMI) is a second but less desirable measure related to body composition. It is an indication of the appropriateness of a youngster's weight related to height. These values are used for its computation. To enhance the evaluation of body composition using BMI, BMI values corresponding to various levels of percent body fat using methods presented by Lohman (1994) have been developed and are presented in tables within this manual. BMI can be matched to corresponding levels of percent body fat and, thus, the same standards may be used for evaluative purposes. Testers should take extreme care to use accurate information for interpreting BMI scores for youngsters with physical disabilities. Underestimates of either height (e.g., due to contractures at the knees or hips) or weight (e.g., due to a missing limb or loss of active muscle mass) can invalidate the standards.

Musculoskeletal Functioning

Musculoskeletal functioning combines three traditional components of physical fitness: muscular strength, muscular endurance, and flexibility/range of motion. The relationship between musculoskeletal functioning and health (especially functional health) has a logical basis. Certain levels of strength, endurance, and flexibility are necessary to maintain good posture, live independently, and participate in leisure time activities.

The **bench press**, **dumbbell press**, **extended arm hang**, **flexed arm hang**, **grip strength**, **isometric push-up**, **push-up**, **modified pull-up**, **pull-up**, **curl-up**, **modified curl-up**, and **trunk lift** are all measures of musculoskeletal function related primarily to muscular strength and endurance. Although each of these test items can be justified on the basis of logical validity, no specific level of strength and endurance has been identified as critical for health. Instead, criterion-referenced standards associated with these items are primarily based on expert opinion (Plowman & Corbin, 1994). The basis for the minimal general standards associated with some of these tests is to score at or above the 20th percentile for the general population. Preferred general standards are associated with ability to score at or above the 60th percentile for the general population. For the trunk lift, a single general standard based on expert opinion and representing a good (preferred) level of fitness is used.

Specific standards for some of these muscular strength/endurance items are provided for youngsters with mental retardation and mild limitations in fitness. There is a consistent trend in the literature that documents a performance discrepancy between youngsters who are retarded and nonretarded on many measures of muscular strength/endurance. Factors such as motivation, fewer opportunities to train, fewer opportunities to participate in physical activity, poor instruction, and/or physiological factors have been cited by researchers attempting to explain the performance gap. Where specific standards are provided for mentally retarded youngsters, standards are lowered from the minimal general standards by a percentage that ranges from 25-50%. The particular percentage utilized is an estimate of the performance discrepancy identified for a specific item in previous research. No specific standards are provided for youngsters with physical disabilities on these measures of muscular strength and endurance. Selecting appropriate test items is especially important for these youngsters. Youngsters with some form of paraplegia (due either to cerebral palsy or spinal cord injury) should be able to achieve minimal general standards for upper body measures involving the hands and/or arms, but may have difficulty with measures of trunk or abdomen. Unilateral test items such as grip strength and dumbbell press have the most relevance for youngsters with some types of cerebral palsy, particularly hemiplegia, as well as for single limb amputees.

The **reverse curl**, **seated push-up**, **40-meter push/walk**, and **wheelchair ramp test** are items which are also related to muscular strength/endurance and are most appropriate for youngsters with some types of physical disabilities. Bases for specific standards for these items come from their relationship to activities of daily living (ADLs). The specific standard for the **reverse curl** is tied directly to the functional ability of lifting a one-pound weight one time. It is assumed that

such an ability might have functional significance for youngsters who are more severely disabled (especially those with low level cervical spinal cord injury) who might hope to lift a light-weight object in performing activities of daily living.

The specific standard for the **seated push-up** is selected on the basis of two possibilities. The five-second standard is related to the recommendation that wheelchair-users should relieve the skin pressure on their buttocks and legs for approximately 5 seconds every 15 minutes. Such a regimen is believed to reduce risk of developing pressure sores (decubitus ulcers) (Kosiak & Kottke, 1990). The 20-second specific standard for the seated push-up would be selected if health-related concerns relating to other ADL's require longer strength/endurance needs.

The basis for the specific standard for the **40-meter Push/Walk** is potential for functional mobility. The minimum value for functional walking speed in adults is approximately 40 meters per minute (Waters, 1992). This value has been adopted as the specific standard, providing it can be attained at a heart rate of 125 or below (see adjustments for disability in the description of the test item). If youngsters can travel at 40 m/min. at this light intensity, it is assumed they can maintain that functional speed over longer distances required for the performance of ADLs in the community.

The standards for the **wheelchair ramp test** are related to the American National Standards Institute (ANSI) recommendations that ramps be constructed with an incline ratio of 12 inches of run for every inch of rise in elevation. A ramp built to negotiate a 2 foot elevation, therefore, must be 24 feet long. For the ramp test, two possibilities for specific standards also exist. The first, a standard of 8 feet of run is linked to the ability to ascend 8 inches of elevation, or the height of approximately one step. Curb-cuts have a maximum rise of 8 inches and steps for stairs have a uniform height of 7 inches. The second, the 15-foot standard, is actually a floating standard that can be matched to the length of a ramp (up to 30 feet) the youngster may encounter on a daily basis. Testers may set this standard anywhere between 15 and 30 feet, therefore, depending upon the mobility demands placed on the youngster on a daily basis.

The **shoulder stretch**, **Apley test** (modified), **Thomas test** (modified), **back saver sit and reach**, and **Target Stretch Test** (TST) are tests of flexibility/range of motion in this battery. The **shoulder stretch** and **Apley** are tests of shoulder flexibility. The **shoulder stretch** is scored pass/fail and is justified solely on a logical basis. A pass score is the general standard and indicative of optimal shoulder flexibility. Only pass or fail standards are provided for the **shoulder stretch**.

The modified **Apley** is scored on a 0-3 scale: 3 indicates optimal shoulder flexibility; 2 suggests that enough shoulder flexibility exists to potentially perform some functional activities such as washing or combing the hair or removing a cap; 1 is indicative of the potential to perform functional activities such as eating and brushing the teeth; and 0 means the youngster has insufficient flexibility to accomplish any of the tasks listed above. A 3 is the general standard,

and it is expected that most youngsters can achieve it. Specific standards are provided only for youngsters with a more severe form of cerebral palsy (classes C1 and C2).

The **Modified Thomas Test** measures hip flexibility, but is only recommended for ambulatory youngsters. For the modified **Thomas,** scores are tied to extent of limitation in the hip flexors: a score of 3 indicates optimal hip extension; a 2 suggests some tightness exists in the hip flexors that results in up to an approximate 15 degree loss in range of motion; a 1 is interpreted to mean that the loss of range of motion is between approximately 15 and 30 degrees; and a 0 means loss of range of motion exceeds approximately 30 degrees. The general standard is a 3. A specific standard is provided only for those youngsters with a type of cerebral palsy that typically restricts hip flexibility (Class C5 and C7 for the affected side).

The **back saver sit and reach** has been shown to measure validly hamstring flexibility (Plowman & Corbin, 1994). Sit and reach tests have been included in health-related fitness test batteries for a number of years because of a presumed relationship to low back pain. Although research evidence has yet to confirm this relationship, anatomical logic for it is strong (Plowman & Corbin, 1994). Only general standards are provided in this manual. As with many test items of muscular strength/endurance, the particular standard on the **back saver sit and reach** is based on expert opinion (Plowman & Corbin, 1994).

The **Target Stretch Test** is a subjective measure of movement extent that can be applied to a number of joint actions. Individualized standards (those which are developed by teachers for specific student needs) are recommended for some youngsters. For most youngsters, however, the basis for the minimal general standard is to have functional range of motion on at least one side of the body. Functional range of motion is represented by a score of 1 on the test. This was considered by the Project Target Advisory Committee as a clinically acceptable level of range of motion that is generally obtainable and meets minimal requirements for functional activity. The preferred general standard, represented by a score of 2 on the test, depicts optimal range of motion for a particular joint. Youngsters who are free of physical impairments should strive for the preferred standard on the TST.

Sources of Standards

Standards which are recommended in connection with the Brockport Physical Fitness Test come from a variety of sources. Several criterion-referenced health-related standards appropriate for the general population and, at times, recommended for youngsters with disabilities are associated with the Prudential FITNESSGRAM (CIAR, 1992). These include standards for the following items: VO_{2max}, one-mile run/walk, 20m PACER (Table 4.13) skinfold, percent body fat, body mass index (Tables 4.16 and 4.17) curl-up and trunk lift (Table 4.22); push-up, pull-up, and modified pull-up (Table 4.18); flexed arm hang (Table 4.19); back saver sit and reach and shoulder stretch (Table 4.23).

Standards for VO_{2max} and the one-mile run/walk appearing in the Prudential FITNESSGRAM were based upon procedures used and results attained by Cureton and Warren (1990) and standards for the 20m PACER were based on the work of Leger, Mercier, Gadoury, & Lambert (1988). Their use in Prudential FITNESSGRAM is described by Cureton (1994a).

Standards related to body composition used in the Prudential FITNESSGRAM were developed as described by Lohman (1994). Lohman (personal communication, May, 1997) subsequently provided additional skinfold and body mass index values for the BPFT associated with minimal general standards and preferred general standards (See Tables 4.16 and 4.17).

Standards associated with several musculoskeletal test items in the Prudential FITNESSGRAM were based on expert opinion following a review of normative data associated with nondisabled youngsters (Plowman and Corbin, 1994). These include the push-up, the pull-up, modified pull-up, flexed arm hang, trunk lift, curl-ups, shoulder stretch, and back saver sit and reach. Standards reflecting performance of the general population on items not associated with the Prudential FITNESSGRAM were developed on the basis of data collected on 913 youngsters from the Brockport Central School District (Brockport, New York). Minimal and preferred standards related to performance of the general population in connection with the dumbbell press (Table 4.18), 35-lb. bench press (Table 4.19), extended arm hang (Table 4.19), grip strength (Table 4.20), and isometric push-up (Table 4.20) were based, in part, on these data. General standards for the Apley, Thomas, and TST (Table 4.23) were based on expert opinion (Advisory Committee, 1997). General standards for the Target Aerobic Movement Test (Table 4.13) were based on expert opinion (Advisory Committee, 1997).

Specific standards were also based upon expert opinion, related literature, and data collected involving samples of youngsters with disabilities. Data collected as a part of Project Target were used to field-test suitability and attainability of test items, reliability, and standards related to the 35-lb. bench press (Table 4.20), extended arm hang (Table 4.20), flexed arm hang (Table 4.20), the curl-up (modified) (Table 4.22), grip strength (Table 4.20), isometric push-up (Table 4.20), seated push-up (Table 4.21), reverse curl (Table 4.21), 40m push/walk (Table 4.21), modified Apley and Thomas tests (Table 4.24), the 16m and 20m PACER (Tables 4.14 and 4.15), and the one-mile run/walk (Table 4.15). Data associated with Project UNIQUE (Winnick and Short, 1985) were also consulted in selecting standards for the flexed arm hang, grip strength, and skinfold measures. Recommended specific standards for youngsters with mental retardation were developed following particular consultation of data provided by Eichstaedt, Polacek, Wang, and Dohrman (1991); Hayden (1964); and the Canada Fitness Award, (Government of Canada Fitness and Amateur Sport, 1985). Standards associated with TST are based on optimal levels of range of motion presented by Cole & Tobis (1990) and functional standards were recommended by the Project Target Advisory Committee (Advisory Committee, 1997).

Chapter III

Using the Brockport Physical Fitness Test

This test manual provides a physical fitness test and a process for modifying the test for youngsters with unique needs. Components of fitness, profile statements, test items, and standards are suggested for youngsters in the general population; with mental retardation and mild limitations in fitness; with visual impairments (blindness); with cerebral palsy; with spinal cord injuries; and those with congenital anomalies and amputations. For each group covered in this manual, parameters of fitness (components, profiles, tests, and standards) are recommended based upon information found in the professional literature and/or expressed by experts in the field. However, the health-related needs of a particular individual may vary from those of others in a particular group and require adjustments in the parameters. This chapter provides general information on how to test and evaluate using the BPFT and distinguishes use of the Brockport Physical Fitness Test for three alternatives: 1) using existing test items and standards in the BPFT; 2) adjusting the BPFT for youngsters with disabilities; and 3) using the BPFT with other tests. A final section deals briefly with IEP development.

Using Existing Test Items and Standards in the BPFT

It is expected that the most common use of the Brockport Physical Fitness Test will be for testers to use existing test items and standards in the test with youngsters who have specific disabilities. While such an approach may not reflect the notion of personalization in the strictest sense, there are a number of advantages to this strategy. First, since parameters were developed with specific target populations in mind it is likely they are relevant for a youngster from a particular group. Second, each test item included in the battery is considered a valid and reliable health-related measure for members of the target population. Third, standards are recommended based, in part, on field testing with subjects from the various target populations. And, finally, adopting recommended test items and standards will save the tester time when attempting to personalize.

Testers who choose to use the BPFT in this fashion will follow a four-step process when administering the test:

* Accurately classify/subclassify each youngster
* Select appropriate test items
* Measure physical fitness status by administering test items
* Evaluate health-related physical fitness

The testers first responsibility is to accurately classify (eg., spinal cord injury, blindness, etc.) the youngster to be tested. For youngsters with physical disabilities it also will be necessary to

subclassify according to the nature and extent of the disability. Testers will need to consult the definitions and classifications section of this manual (See Chapter I) to complete this responsibility.

Once the youngster is classified (and subclassified, as necessary), the tester uses the test selection guides (Tables 4.2, 4.4, 4.6, 4.8, and 4.10) to choose test items to be administered. (When selecting test items in this manner the tester is implicitly adopting the desired profile written for a specific disability group because the items were derived from the profile statements.)

When consulting test selection guides, it will become apparent immediately that some test items are recommended and others are optional. A recommended test item is one that relates to a particular component of physical fitness and a specific profile statement and generally is believed to be the "best" test of those parameters for a particular class of youngsters. A recommended item is considered the first choice, but not necessarily the only choice, in test selection. An optional item also addresses specific components and profile statements and provides an additional choice for testers. Testers may select an optional item over a recommended item for any number of reasons including equipment availability, facility requirements, personal characteristics of the youngster, specific purpose of the testing, and so forth. Whether testers choose recommended or optional items it is anticipated that ordinarily the test battery will consist of between four and six test items: one from aerobic functioning, one from body composition, and two-to-four from musculoskeletal functioning. Recommended and optional test items, along with available standards, are summarized for each of the target populations in Table 3.1.

The third responsibility of the tester is to measure physical fitness status by administering test items appropriately. Information for this purpose is presented in Chapter V. This chapter provides general recommendations for test administration including necessary equipment, scoring, trials, test modifications and suggestions for test administration, as well as a section pertaining to safety guidelines and precautions. Once test items are administered, the results are recorded on a test form. Experienced testers are encouraged to develop recording systems that work best for them, but a sample form is provided in Table 3.2.

The tester's final responsibility is to evaluate the health-related physical fitness level of each youngster. Youngsters are evaluated by comparing their results on recommended or optional tests with criterion-referenced standards appropriate for them. The derivation of standards associated with test items of various groups are summarized in Tables 4.1, 4.3, 4.5, 4.7, 4.9, and 4.11. The standards appear in Tables 4.12 to 4.24.

Both general and specific standards may be available to the tester when evaluating the physical fitness of youngsters with specific disabilities. General standards are available for almost all test items and are recommended when expectations for performance are typical of the general population (i.e., it is believed that a disability does not result in a unique physical fitness need nor significantly alters performance expectations for the youngster). Specific standards are available for selected items when it is believed a particular disability dictates an adjustment to general

Table 3.1
Summary of Recommended and Optional Test Items with Available Standards

	General Population		Mental Retardation		Blind with Assistance		Cerebral Palsy		Spinal Cord Injury		Congenial Anomalies/ Amputation	
	Test Item	Avail. Stand.	Test Item	Avail. Stand.	Test Item	Avail. Stand.	Test Item	Avail. Stand	Test Item	Avail Stand.	Test Item	Avail. Stand.
Aerobic Functioning												
PACER (20m)	O	G	R#	S	R	S					O#	G
PACER (16m)			R#	S								
One-Mile Run	R	G			O#	S					R#	G
TAMT		G•	R	G•			R	G•	R	G•	R#	G•
Body Composition												
Skinfolds	R	G	R	G	R	G	R	G	R	G	R	G
BMI	O	G	O	G	O	G	O	G				
Musculoskeletal Functioning												
Reverse Curl									R#	S•		
Seated Push-up							R#	S	R#	S	R#	S
40m Push/Walk							R#	S•				
Wheelchair Ramp Test							R#/O#	S•				
Bench Press		G	O#	S					O#	G	R#	G
Dumbbell Press		G					R#/O#	G	O#	G	R#/O#	G
Extended Arm Hang		G	R#	S								
Flexed Arm Hang	O	G	R#	S	O	G						

	General Population		Mental Retardation		Blind with Assistance		Cerebral Palsy		Spinal Cord Injury		Congenial Anomalies/ Amputation	
	Test Item	Avail. Stand.	Test Item	Avail. Stand.	Test Item	Avail. Stand.	Test Item	Avail. Stand	Test Item	Avail Stand.	Test Item	Avail. Stand.
Grip Strength		G	O	S			O#	G	R#	G	R#	G
Isometric Push-up		G	O#	S								
Push-up	R	G			R	G						
Pull-up	O	G			O	G						
Modified Pull-up	O	G			O	G						
Curl-up	R	G			R	G					R#	G
Modified Curl-up			R	S								
Trunk Lift	R	G*	R	G*	R	G*					R#	G*
Apley		G*					R#	G*/S*	R#	G*	R#	G*
Shoulder Stretch	O	G*	O	G*	O	G*					R#	G*
Thomas		G*					R#	G*/S*	R#	G*		
Back Saver	R	G*	R	G*	R	G*					R#	G*
TST		G					R#/O#	G	R#	G	R#	G

*only single standard is available
item is recommended or optional for some, but not all, members of the category (consult test item selection guides)

R = Recommended Test Item O = Optional Test Item G = General Standard
S = Specific Standard Avail. Stand. = Available Standard

standards for a particular test (or when the test item is unique to a particular disability). Testers should not assume general standards are not attainable by a youngster within a specific disability category. In fact, teachers are encouraged to select general standards, even when specific standards are available, when general standards are believed to be attainable by a particular youngster.

The evaluation of health-related fitness includes an interpretation of results and identification of unique needs, if any. Identified needs may be incorporated as part of an individualized education program (IEP) for a youngster. Table 3.3 presents a completed sample test form which reflects this process.

Adjusting the BPFT

Although recommended fitness parameters are likely to pertain to most youngsters from a specific target population, they may not be appropriate for all. In the Brockport Physical Fitness Test, testers always have latitude to adjust the parameters to meet the unique needs of a youngster. Testers may choose to delete, alter, or substitute profile statements related to components of fitness, test items, or standards.

Testers, for instance, may wish to use the form in Table 3.4 as a way of personalizing desired profiles for individual youngsters. As an example, assume a teaching is working with a boy who has a mild form of cerebral palsy. The teacher reviews the fitness parameters recommended for youngsters with cerebral palsy (See Table 4.9) and decides to adopt the profile, items, and standards, as recommended. However, the teacher also would like to include a measure of abdominal strength and endurance for this youngster even though such a statement is not included in the recommended profile. The teacher could "write" a new profile by checking all the relevant profile statements in Table 3.4 including "acquire/maintain levels of abdominal strength/endurance to reduce the risk of developing lower back pain and to participate in physical activities." Then, the teacher consults Table 2.1, finds the appropriate profile statement, selects the relevant test (either curl-ups or modified curl-ups in this case), and either adopts the appropriate health-related standards available for the test or creates individualized standards for the youngster.

In some cases the profile might be appropriate for a youngster, but the recommended or optional test items might not be the best. Consider a girl who is blind and who also has an additional impairment that results in a significant loss of function in her right arm. The push-up test is recommended for youngsters who are blind, but the teacher believes it is inappropriate for this student. Instead the teacher consults Table 2.1 and selects an alternative measure of upper body strength/endurance that can be administered to just one side of the body (i.e., dumbbell press or grip strength). The teacher might decide properly to use the general standards to assess the strength/endurance of the youngster's left hand or arm.

Table 3.2
Sample Brockport Physical Fitness Test Form

Student's Name: _____ Gender (M/F): _____ Age(Years): _____

Height(in.): _____ Weight(lb): _____ Date: _____
Classification: _____ Subclassification: _____

Test Item	Units of Measure	Test Score	Specific Standard	General Standards Min.	Pref.
Aerobic Functioning					
Aerobic Capacity					
Aerobic Behavior					
TAMT					
Body Composition					
Body Mass Index					
Musculoskeletal Functioning Strength & Endurance					
Flexibility/Range of Motion					

Interpretation: _____

Needs: _____

Table 3.3
Sample Completed Brockport Physical Fitness Test Form

Student's Name: LeRoy Slimmer Gender (M/F): M Age(Years): 14

Height(in.): 68 Weight(lb): 150 Date: 2-17-97

Classification: MR - Mild Limitations Subclassification: NA

Test Item	Units of Measure	Test Score	Specific Standard	General Standards Min.	General Standards Pref.
Aerobic Functioning					
Aerobic Capacity					
Aerobic Behavior					
TAMT	min.	P			P
Body Composition					
Sum of Triceps and Subscapular Skinfolds	mm.	27		14-31	14-25
Body Mass Index					
Musculoskeletal Functioning Strength & Endurance					
Dominant Grip	Kg.	25	22	33	42
Flexed Arm Hang	Sec.	06	08	15	20
Curl-up (Modified)	#	16	14	24	45
Flexibility/Range of Motion					
Back Saver Sit and Reach	in.	8			8
Trunk Lift	in.	9			9-12

Interpretation: meets general standards on the TAMT, back saver, and trunk lift; meets minimal general standards for body composition; meets specific standards for dominant grip and curl-up (modified); fails specific standard for flexed arm hang.

Needs: Priority 1 - upper body strength/endurance
Priority 2 - abdominal strength/endurance

Table 3.4
Physical Fitness Profile Sheet

Name: _____ Date: _____

Gender: _____ Age: _____ Disability: _____

Disability Subclassification: _____

Physical Fitness Profile: Considering the health-related needs of this student, construct a profile by placing check marks next to those statements which are most relevant to the fitness needs of this youngster. Then, select specific test items and standards for measurement and assessment.

Aerobic Functioning

Aerobic Capacity
_____ attain levels of aerobic capacity consistent with positive physiological health.

Aerobic Behavior
_____ attain levels of aerobic behavior consistent with positive functional health.

Body Composition

Subcutaneous Fat
_____ maintain levels of subcutaneous body fat consistent with positive physiological health.

Weight for Height
_____ maintain a weight that is appropriate for one's height.

Musculoskeletal Functioning

Strength/Endurance
_____ acquire/maintain functional levels of upper body strength/endurance consistent with independent living: a) ability to grasp and lift a light weight; b) ability to lift and transfer the body from a wheelchair; and/or c) ability to attain functional wheelchair mobility.
_____ acquire/maintain levels of upper body strength/endurance for participation in physical activities.
_____ acquire/maintain levels of trunk extension strength/endurance/flexibility to reduce the risk of developing lower back pain.
_____ acquire/maintain levels of abdominal strength/endurance to reduce the risk of developing lower back pain and to participate in physical activities.

Flexibility/Range of Motion
_____ acquire/maintain at least functional range of motion in various joints of the body.
_____ acquire/maintain functional or optimal levels of flexibility in one or more of the following regions of the body: a) shoulders; b) hips; and/or c) hamstrings.

Whenever teachers make adjustments to the general procedures they are encouraged to use the schematics in Table 2.1 as a basis for changing either profiles, items, or standards. Of course testers also are free to develop their own fitness parameters as they deem necessary, but when testers "go off on their own" it is recommended that they carefully document the parameters including the bases for the standards.

Using the BPFT with Other Tests

Youngsters with disabilities are often able to perform one or more of the same test items and achieve the same performance standards as youngsters in the general population. Teachers in inclusive settings, for example, are encouraged to administer the same test items from their regular test battery to both youngsters with and without disabilities when appropriate. There may be times, however, when either the test or standards will need to be different for a youngster with a disability. In these circumstances the Brockport Physical Fitness Test can serve as a reference which can be used by a teacher to "fill-in" gaps which exist in a testing program for a particular youngster. Teachers who use the Prudential FITNESSGRAM as their regular test battery will find it relatively easy to substitute items and/or standards from the Brockport Physical Fitness Test because of similarities existing between the two tests. Regardless of which test a teacher may use, however, the Brockport Physical Fitness Test can be used as a resource for personalization. As another option, those teaching both students with and without disabilities may wish to adopt the Brockport Physical Fitness Test as a single test that can be used with the general population as well as with youngsters with disabilities.

IEP Development

As a closing thought, teachers should recognize how the personalized approach of the Brockport Physical Fitness Test is consistent with requirements for developing an individualized education program (IEP). Profile statements reflecting unique needs (with modifications as necessary) can be viewed as annual goals for the student's physical fitness. Test scores obtained by the youngster can serve as entries under the present level of performance section of the IEP. Standards (either general or specific) can be consulted by the teacher and adopted or modified as performance criteria associated with short-term instructional objectives.

Chapter IV

Profiles, Test Selection Guides, and Standards

In the next section, health-related criterion-referenced parameters, test selection guides, and standards for assessing physical fitness are presented. This section includes a series of tables presenting standards for the assessment of health-related criterion-referenced physical fitness.

Table 4.1
Health-Related Criterion-Referenced Physical Fitness
Parameters for Youngsters in the General Population

Health-Related Concerns:

High blood pressure, coronary heart disease, obesity, diabetes, some forms of cancer, and other health problems; lower back health; and functional health.

Desired Profile:

Boys and girls, ages 10-17, should at minimum, possess levels of maximum oxygen uptake and body composition consistent with positive health, flexibility for functional health (especially good functioning of the lower back), and levels of abdominal and upper body strength and endurance for independent living and participation in physical activities.

Components of Physical Fitness:

The components of physical fitness are categorized as aerobic functioning, body composition, and musculoskeletal functioning. Test items to assess components appear in Table 4.2.

Standards

Aerobic Functioning - For the general population, aerobic functioning is evaluated using minimal and preferred general standards presented in Table 4.13. The minimal general standard represents the lowest level of VO_{2max} consistent with minimizing disease risk and adequate functioning capacity for daily living. Preferred general standards represent a good level of aerobic capacity associated with a lower disease risk in adults and a higher functional capacity (Cureton, 1994a). One mile and PACER standards presented in Table 4.13 are measures which correspond to minimal and preferred general VO_{2max} standards.

Body Composition - For the general population, percent body fat is estimated from skinfold measures and is evaluated using general standards appearing in Tables 4.15 and 4.16. Minimal general standards (Table 4.15) for body composition reflect percent body fat ranging from 10-25% for males and 17-32% for females. These represent minimally acceptable ranges of percent body fat. The preferred general standards (Table 4.16) reflect optimal levels of percent body fat ranging from 10-20% for males and 17-25% for females. BMI data corresponding to minimal and preferred % fat for each age group of boys and girls are presented in Tables 4.15 and 4.16.

Musculoskeletal Functioning - General standards are also used in evaluating nondisabled youngsters in the general population. Standards associated with musculoskeletal functioning are based on expert opinion from analysis of normative data. Minimal muscular strength and endurance standards correspond closely to fitness levels equal to the lower 20th percentile and preferred standards to a fitness level equal to approximately the 60th percentile of the general

Table 4.1 (cont'd)

population. General standards are presented in Table 4.18 for push-up, modified pull-up, and pull-ups. General standards for flexed arm hang are presented in Table 4.19 and for curl-up in Table 4.22. General standards associated with test items designed to assess flexibility (back saver sit and reach and shoulder stretch) or trunk extension strength and flexibility (trunk lift) are presented in Tables 4.22 and 4.23. They are based on normative data and expert judgement as to what represents an acceptable level of function. A single criterion-referenced score for the back saver sit and reach and shoulder stretch represents the recommended general standard and consequently, a good level of flexibility for these items. For the trunk lift test, the minimal acceptable score is 9 inches, and the maximum score 12 inches. Scores beyond 12 inches are discouraged.

Table 4.2
Test Item Selection Guide
for Youngsters in the General Population

Fitness Component and Test Item	Selection Guide
Aerobic Functioning	
Select One:	
Aerobic Capacity	
●One Mile Run/Walk	R
●The PACER (20m)(Recommended for grades K-3)	O
Body Composition	
Select One:	
●Skinfolds Sum of Triceps & Calf	R
●Body Mass Index (BMI)	O
Musculoskeletal Function	
Required:	
●Curl-up test	R
●Trunk lift	R
Select One:	
●Push-up	R
●Modified Pull-up	O
●Pull-up	O
●Flexed Arm Hang	O
Select One:	
●Back saver sit and reach	R
●Shoulder stretch	O

R = Recommended
O = Optional

Table 4.3
Health-Related Criterion-Referenced Physical Fitness Parameters for Youngsters with Mental Retardation and Mild Limitations in Physical Fitness

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Health-Related Concerns:

Health-related needs and concerns of youngsters in the general populations; inability to sustain aerobic activity; musculoskeletal functioning within acceptable levels for independent living and participation in daily living activities (including sport and movement activities).

Desired Profile:

Boys and girls, ages 10-17 with mental retardation and mild limitations in physical fitness, should, at minimum, possess levels of aerobic behavior consistent with ability to sustain moderate physical activity, or possess a level of aerobic capacity consistent with positive health; body composition consistent with positive health; healthful levels of flexibility/range of motion (especially of the lower back), and levels of abdominal and upper body strength and endurance appropriate for independent living, participation in physical activities, and progress toward performance levels of peers in the general population.

Components of Physical Fitness: Components of physical fitness are categorized as aerobic functioning, body composition, and musculoskeletal functioning. Test items to assess components appear in Table 4.4.

Standards: The physical fitness of youngsters with mental retardation is evaluated using specific and general standards. Youngsters meeting general standards related to body composition, aerobic behavior, and flexibility meet minimally acceptable to good health-related levels of physical fitness for the general population. Youngsters meeting specific standards for test items measuring strength/endurance and aerobic capacity attain minimally acceptable levels of physical fitness adjusted for the effects of impairment. These progress toward acceptable and/or good levels of health-related physical fitness for the general population.

Aerobic Functioning - Aerobic capacity for youngsters with mental retardation is evaluated using specific and general standards. Specific standards for VO_{2max} and the 16m and 20m PACER represent minimally acceptable levels of aerobic capacity adjusted for youngsters with mental retardation. These are based on a 10% adjustment from minimal general standards recommended for youngsters in the general population. They are presented in Table 4.15. This adjustment is based upon a VO_{2max} 8-12% lower than for nondisabled individuals of the same age (Shephard, 1990). Minimal general standards presented in Table 4.13 for VO_{2max}, the one mile run/walk, and the 16m and 20m PACER reflect minimally acceptable levels of aerobic capacity associated with the general population. These minimal general standards represent the lowest level of VO_{2max} consistent with minimizing disease and adequate functioning for daily living. Aerobic behavior is measured by the TAMT. For the TAMT, performance for

Table 4.3 (cont'd)

15-minutes at level 1 is the set standard representing ability to sustain moderate physical activity. The same standard exists for all levels of the test. Level I is the minimal level of aerobic behavior recommended for youngsters with mental retardation and mild limitations in physical fitness.

Body Composition - General standards appearing in Tables 4.16 and 4.17 are recommended for evaluation of body composition of youngsters with mental retardation and mild limitations in physical fitness. Minimal general standards for body fat and BMI are based on 10-25% body fat for males and 17-32% body fat for females. Preferred general standards are based on a 10-20% range for body fat for males and a 17-25% range for body fat for females.

Musculoskeletal Functioning - Specific standards are used for the evaluation of dominant grip, extended arm hang, isometric push-up, bench press, and flexed arm hang for youngsters with mental retardation and mild limitations in physical fitness. They reflect minimally acceptable levels of strength/endurance adjusted for mental retardation. They are presented in Table 4.20. Specific standards are based on analyses of performance discrepancies between youngsters with and without disabilities. For purposes of the Brockport Physical Fitness Test, mild limitations in performing these test items are defined as discrepancies between 50 to 75% of performance of peers in the general population. Specific standards for youngsters with mental retardation represent the following percentages relative to minimal general standards: dominant grip (65%), extended arm hang (75%), isometric push-up, bench press, flexed arm hang, and modified curl-up (60%). Minimal and preferred general standards for the general population for dominant grip, extended arm hang, isometric push-up, and bench press represent the 20th and 60th percentile, respectively, of performance by a Brockport sample of youngsters from the general population (Table 4.19). Minimal and preferred general standards for flexed arm hang and modified curl-ups are taken from the lower and upper end of the healthy fitness zone, respectively, from the Prudential FITNESSGRAM (CIAR, 1992). General standards for the back saver, trunk lift, and shoulder stretch test items, reflecting good levels of physical fitness for the general population duplicate those identified from the FITNESSGRAM. These appear in Tables 4.22 and 4.23.

Table 4.4
Test Item Selection Guide for
Youngsters with Mental Retardation and
Mild Limitations in Physical Fitness

Fitness Component and Test Item	Selection Guide
Aerobic Functioning	
Select One:	
Aerobic Behavior	
●Aerobic Movement Test (Level 1)	R
Aerobic Capacity	
●PACER (16m) (Ages 10-12) or PACER (20m) (Ages 13-17)	R
Body Composition	
Select One:	
●Skinfolds	
Sum of Triceps and Calf	R
Sum of Triceps and Subscapular	O
●Body Mass Index	O
Musculoskeletal Function	
Select One:	
●Dominant Grip (Ages 10-17) or Bench Press (Ages 13-17)/Isometric push-up (10-12)	O
Select One:	
●Extended Arm hang (Ages 10-12) or Flexed Arm hang (Ages 13-17)	R
Select One:	
●Back Saver sit and reach	R
●Shoulder Stretch	O
Required:	
●Curl-up (Modified)	R
●Trunk Lift	R

R = Recommended
O = Optional

Table 4.5
Health-Related Criterion-Referenced Physical Fitness Parameters
for Youngsters with Visual Impairments

Health-Related Concerns:

Health-related needs and concerns of youngsters in the general population; musculoskeletal function necessary for appropriate pelvic alignment and posture.

Desired Profile:

Boys and girls, ages 10-17, should, at minimum, possess levels of maximum oxygen uptake and body composition consistent with positive health; flexibility for functional health (especially appropriate pelvic alignment and posture, and functioning of the lower back), and levels of abdominal and upper body strength and endurance for independent living and participation in physical activities.

Components of Physical Fitness: Components of physical fitness are categorized as aerobic functioning, body composition, and musculoskeletal functioning. Test items to assess components appear in Table 4.6.

Standards

Aerobic Functioning - In evaluating aerobic functioning of youngsters with visual impairments, the same standards used for the general population may be used for youngsters with visual impairments with one exception. Specific standards are recommended for youngsters who are blind and require and use assistance in performing the one-mile run/walk and the PACER. Adjustments provide a bonus of 10 percentile points given to youngsters who are blind. These specific standards are presented in Table 4.14. General standards may also be used regarding youngsters who are blind and need assistance with running on the one-mile run/walk and the 20m PACER. Youngsters attaining these standards (See Table 4.13) meet unadjusted minimal general standards. For emphasis, it is important to remember that most youngsters with visual impairments may be evaluated using the same general standards as used for their sighted peers.

Body Composition - In evaluating body composition, minimal and preferred general standards associated with percent body fat and BMI appearing in Tables 4.16 and 4.17 are recommended for youngsters with visual impairments. Minimal general standards for body fat and BMI are based on a minimal acceptable range of 10-25% body fat for males and 17-32% body fat for females. Preferred general standards are based on an optimal range of 10-20% of body fat for males and a 17-25% optimal range of body fat for females.

Table 4.5 (cont'd)

Musculoskeletal Functioning - It is recommended that youngsters with visual impairments be evaluated using minimal and preferred general standards. Standards for the curl-up test (Table 4.22), trunk lift (Table 4.22), push-up (Table 4.18), modified pull-up (Table 4.18), pull-up (Table 4.18), and flexed arm hang (Table 4.19) correspond respectively to upper and lower values associated with standards for youngsters in the general population. Standards recommended for the back saver sit and reach and the shoulder stretch are presented in Table 4.23. These standards represent levels of musculoskeletal functioning consistent with the general population.

Table 4.6
Test Item Selection Guide
for Youngsters with Visual Impairments

Fitness Component and Test Items	Selection Guide
Aerobic Functioning	
Aerobic Capacity	
Select One:	
●PACER (20m) (ages 10-17)	R
●One Mile Run/Walk (ages 15-17)	O
Body Composition	
Select One:	
●Skinfolds	
Sum of Triceps & Calf	R
●Body Mass Index	O
Musculoskeletal Function	
Required:	
●Curl-up Test	R
●Trunk Lift	R
Select One:	
●Push-up	R
●Modified Pull-up[1]	O
●Pull-up	O
●Flexed Arm Hang[1]	O
Select One:	
●Back-saver Sit-and-reach	R
●Shoulder Stretch	O

R = Recommended
O = Optional

[1] Use flexed arm hang or modified pull-up for individuals unable to perform one pull-up.

Table 4.7
Health-Related Criterion-Referenced Physical Fitness Parameters for Youngsters with Spinal Cord Injuries

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Health-Related Concerns:

Health-related needs and concerns typical of youngsters in the general population; inability to sustain aerobic activity; lack of flexibility/range of motion of the hips and/or upper body, particularly the shoulder; lack of strength and endurance to lift and transfer the body independently, lift the body to prevent decubitus ulcers, propel a wheelchair; and excessive body fat which inhibits health status.

Desired Profile:

Individuals with spinal cord injuries should, at minimum, possess a physical fitness profile which reflects the ability to sustain moderate physical activity; reflects body composition consistent with positive health; reflects levels of flexibility and range of motion to perform activities of daily living and to inhibit contractures; levels of muscular strength and endurance of wheelchair users to lift and transfer the body, and push a wheelchair; muscular strength and endurance to counteract muscular weaknesses, and fitness levels needed to enhance the performance of daily living activities (including sport activities).

Components of Physical Fitness: Components of physical fitness are categorized as aerobic functioning, body composition, and musculoskeletal functioning. Test items to assess components appear in Table 4.8.

Standards: Standards recommended for evaluation pertain only to test items in Table 4.8 designated as recommended or optional for a specific class of youngsters.

Aerobic Functioning - For youngsters with SCI, aerobic behavior is measured using the TAMT. Completion of Level I of the test for 15-minutes represents ability to sustain moderate physical ability and is the recommended general standard for the test.

Body Composition - In evaluating body composition, minimal and preferred general standards associated with percent body fat are recommended. Specific tables to be used depend on skinfold sites used for testing. Minimal general standards represent minimally acceptable levels of percent body fat and are based on 10-25% body fat for males (sum of triceps and subscapular folds ranging from 13-30mm) and 17-32% for females (sum of triceps and subscapular folds ranging from 18-38 mm) (Table 4.16). Preferred general standard represent optimal levels of percent body fat and are based upon 10-20% body fat for males (sum of triceps and subscapular folds ranging from 13-24 mm) and 17-25% range for females (sum of triceps and subscapular folds ranging from 18-30 mm)(Table 4.17). The BMI test item is not recommended for youngsters with SCI.

Table 4.7(cont'd)

Musculoskeletal Functioning - Musculoskeletal functioning is evaluated using a variety of standards. Minimal and preferred general standards for dominant grip, 35-lb bench press, and 15-lb dumbbell press are based on 20th and 60th percentile values, respectively, of a sample of youngsters from the general population (Tables 4.18 and 4.19). These are considered as minimal and good levels of performance, respectively, based on expert opinion. The 5-second specific standard (Table 4.21) for the seated push-up is related to the recommendation that wheelchair users should relieve skin pressure in their buttocks and legs for at least 5 seconds every 15 minutes. The 20-second standard is a higher level of strength/endurance which would enhance lifting and transferring the body and wheelchair propulsion (Table 4.21). The specific standard for the 1-lb reverse curl is tied directly to the functional ability of lifting a one-pound weight one time (Table 4.21). General standards (Table 4.23) are used for the evaluation of performance on the modified Apley and Thomas tests and on the TST. A score of 3 indicates that youngsters have optimal flexibility of the shoulder joint, and optimal hip extension, respectively. A score of 1 on TST items is a functional range of motion in a joint. A score of 2 is a preferred standard reflecting optimal extent flexibility in a joint (Table 4.23).

Table 4.8
Test Item Selection Guide
For Youngsters with Spinal Cord Injuries

Fitness Component and Test Item	Selection Guide Classification: LLQ Low Level (C6-C8) Quadriplegic	SCI-PW Paraplegic-Wheelchair	SCI Ambulatory
Aerobic Functioning			
Aerobic Behavior			
•Target Aerobic Movement Test (Level 1)	R	R	R
Body Composition			
Select one:			
•Skinfolds			
Sum of Triceps & Subscapular	R	R	R
Triceps (only)	O	O	O
Musculoskeletal Function[2]			
Required (if appropriate):			
•Seated Push-up	O/TA[2]	R	
Select One:			
•Reverse Curl	R		
•Dominant Grip Strength		R	R
•Bench Press (ages 13-17) or Dominant Dumbbell Press (ages 13-17)		O	O
Select Recommended Tests:			
•Apley Test (Modified)		R	R
•Thomas Test (Modified)			R
•Target Stretch Test[1]	R	R[3]	

R = Recommended; O = Optional; TA = Task Analysis

[1] Select at least two items from the Target Stretch Test on the basis of possible participant needs. For LLQ, shoulder abduction, shoulder external rotation and forearm pronation are recommended. For the paraplegic class, shoulder abduction and shoulder external rotation are recommended if the Apley is not passed. Measure both extremities on the Apley, Thomas, and TST and apply health-related standards as appropriate.

[2] Task analysis of muscular strength/endurance test items or variations of test items reflective of the needs and abilities of individuals.

[3] Recommended if the Apley Test is not passed with a score of 3.

Table 4.9
Health-Related Criterion-Referenced Physical Fitness Parameters for Youngsters with Cerebral Palsy

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Health-Related Concerns:

Health-related needs and concerns typical of youngsters in the general population; the inability to sustain aerobic activity; lack of flexibility/range of motion in various joints of the body; insufficient muscular strength/endurance to maintain muscular balance and body symmetry, inability to engage in independent mobility; lift and transfer the body; perform activities of daily living or participate in leisure activities; and either excessive or insufficient body fat which inhibits health status.

Desired Profile:

Individuals with cerebral palsy, at minimum, should possess a physical fitness profile which provides ability to sustain moderate physical activity; body composition consistent with positive health; adequate levels of flexibility and muscular strength and endurance to foster independent living (including mobility), muscle balance and body symmetry, participation in a variety of physical activities (including sport/leisure activities).

Components of Physical Fitness: Components of physical fitness are categorized as aerobic functioning, body composition, and musculoskeletal functioning. Test items to assess components appear in Table 4.10.

Standards: Standards recommended for evaluation pertain only to test items designated as recommended or optional. Musculoskeletal functioning standards may be associated with specific classifications. Youngsters with cerebral palsy are required to attain standards on only one side of the body (i.e., dominant or preferred side) for the following items: Apley, TST, Dumbbell Press, and Grip Strength.

Aerobic Functioning - For youngsters with cerebral palsy, aerobic behavior is measured using the TAMT. Completion of level I of the test for 15-minutes is a general standard which represents ability to sustain moderate physical activity.

Body Composition - Minimal and preferred general standards associated with percent body fat are recommended for use with youngsters who have cerebral palsy. Minimal general standards represent minimally acceptable levels of percent body fat and are based on 10-25% body fat for males and 17-32% body fat for females (Table 4.16). Preferred general standards represent optimal levels of percent body fat and correlate with 10-20% body fat for males and 17-25% body fat for females (Table 4.17). Values for both sum of triceps and subscapular skinfolds and body mass index relate to these body fat ranges. The BMI should be used only if accurate height and weight values can be measured.

Table 4.9 (cont'd)

Musculoskeletal Functioning - Musculoskeletal functioning is evaluated using a variety of standards. Minimal and preferred general standards for dominant grip and 15-lb dumbbell press are based on 20th and 60th percentile values, respectively, of a sample of youngsters from the general population. The specific standard for the 40-meter push/walk (Table 4.21) is suggested for functional mobility (40m/min.) and is based on an acceptable level of time for completing the distance at a light intensity. The standard for functional mobility reflects a minimal level of musculoskeletal ability involving strength, endurance, and flexibility. The 5-second specific standard (Table 4.21) for the seated push-up is related to the recommendation that wheelchair users should relieve the skin pressure on their buttocks and legs for at least 5 seconds every 15 minutes. The 20-second standard (Table 4.21) represents a higher level of strength/endurance which would enhance muscular balance around the elbow, ability to transfer the body, and ability to propel a wheelchair. The wheelchair ramp test 8-foot specific standard reflects the ability to ascend a ramp with approximately one step of elevation (8 inches) such as would be found at a corner curb-cut. The 15-foot specific standard can vary between 15 and 30 inches of rise in elevation (at the discretion of the tester) as a function of the length of a ramp a youngster might frequently encounter in their environment.

Standards for the Apley, Thomas, and TST vary as a function of classification. Apley standards are derived on a logical basis with a 1 indicating potential to perform ADLs pertaining to the mouth (e.g., eating, brushing teeth), a 2 indicating potential to expand ADLs to include those of the head (e.g., combing hair, removing a cap), and a 3 indicating optimal flexibility of the shoulder joint (Tables 4.23 and 4.24). General standards for the Apley (a score of 3) are recommended for classes C2U to C8. A specific standard of 2 is recommended for classes C1 and C2L. Thomas standards (Tables 4.23 and 4.24) relate to flexibility of the hip flexors. General standards for the Thomas (a score of 3) are recommended for classes C6 and C8. A specific standard of 2 is recommended for class C5. For class C7 (hemiplegia), a score of 3 is recommended for the unaffected side while a score of 2 is recommended for the affected side of the body. A 3 indicates optimal flexibility of the hip joint and a 2 indicates that a mild (less than 15%) contracture exists. The TST standard for most of the classes (C3-C8) is the minimal general standards (a score of 1)which represent a clinically accepted functional range of motion in a joint (Table 4.23). The preferred general standard (a score of 2) represents optimal range of motion for a particular joint. TST is also recommended for classes C1 and C2, however, individualized rather than health-related general standards are recommended for these classes. It should be noted that standards for the Apley and TST for youngsters with cerebral palsy are applied to one side of the body.

Table 4.10
Test Item Selection Guide
for Youngsters with Cerebral Palsy

Fitness Component and Test Item	Selection Guide								
	Motorized Wheelchair	Wheelchair				Ambulatory			
	CP-ISRA Sport Classifications								
	C1	C2U*	C2L	C3	C4	C5	C6	C7	C8
Aerobic Functioning									
Aerobic Behavior									
•Target Aerobic Movement Test (Level 1)	R	R	R	R	R	R	R	R	R
Body Composition									
Select One:									
•Skinfolds									
Sum of Triceps & Subscapular	R	R	R	R	R	R	R	R	R
Triceps (only)	O	O	O	O	O	O	O	O	O
•Body Mass Index	O	O	O	O	O	O	O	O	O
Musculoskeletal Function									
Select One or More:									
•Apley Test (modified)[3,4]	R	R		R	R	R	R	R	R
•Thomas Test (modified)[3]						R	R	R	R
•Target Stretch Test[2]	R	R	R	R	R	O	O	O	O
Select One or More (except C1)[1]:									
•Seated Push-up[5]		R		R	R		R		
•40m Wheelchair Push		R	R	O					
•Dominant Grip					O	O		O	O
•Dominant Dumbbell Press (Ages 13-17)				O	O	O		R	R
•40m Walk							R		
•Wheelchair Ramp Test				R					

R = Recommended
O = Optional
* = A class 2 participant with a higher degree of functioning in the upper extremities is grouped under 2U and one with a higher degree of functioning in the lower extremities is grouped under 2L.

1 If recommended test items are inappropriate for individuals classified as class 1, it is recommended that these test items or alternatives important to the individual be task analyzed and be used in connection with individualized developmental progress.

2 Test items should be administered on right and left extremities, as appropriate. TST items particularly important for persons with CP include elbow and shoulder extension, shoulder abduction, shoulder external rotation, and forearm supination. For ambulatory persons, knee extension measurements may be particularly important.

3 Test one or both extremities, as appropriate.

4 Delete this item for class 1 subjects using assistive devices.

5 Test item not recommended for hemiplegic Class 3 and 4 participants. Hemiplegic participants should be given the dumbbell press.

Table 4.11
Health-Related Criterion-Referenced Physical Fitness Parameters for Youngsters with Congenital Anomalies and Amputations (CA/A)

Health-Related Concerns:

Health-related needs and concerns typical of youngsters in the general population; inability to sustain aerobic activity; lack of upper and lower body flexibility/range of motion; lack of muscular strength and endurance of wheelchair users to lift and transfer the body independently, inability to overcome architectural barriers, lift the body to prevent decubitus ulcers, propel a wheelchair; and excessive body fat which inhibits health.

Desired Profile:

Individuals with congenital anomalies/amputations should, at minimum and as appropriate, possess a physical fitness profile which reflects ability to sustain moderate physical activity, and/or which promotes levels of functioning consistent with positive health; body composition consistent with positive health; levels of flexibility and range of motion to perform activities of daily living and to inhibit contractures; levels of muscular strength and endurance of wheelchair users to lift and transfer the body, overcome architectural barriers, and propel a wheelchair; abdominal and upper body muscular strength and endurance to counteract muscular weakness and fitness levels needed to enhance performance of daily living activities (including sport and movement activities).

Components of Physical Fitness: Components of physical fitness are categorized as aerobic functioning, body composition, and musculoskeletal functioning. Test items to assess components appear in Table 4.12.

Standards: Standards recommended for evaluation pertain only to test items in Table 4.12 designated as recommended or optional.

Aerobic Functioning - Aerobic behavior is measured using the TAMT. Completion of Level I of the test for 15-minutes represents ability to sustain moderate physical activity, and is the recommended standard for the test. In regard to aerobic capacity, minimal and preferred general standards for VO_{2max}, one-mile run/walk, and PACER standards are presented in Table 4.13. Minimal standards represent lowest level of VO_{2max} consistent with minimizing disease risk and adequate functioning capacity for daily living. The preferred standards represent a good level of aerobic capacity associated with a lower disease risk in adults and a higher functional capacity (Cureton, 1994).

Body Composition - In evaluating percent body fat, minimal and preferred general standards associated with percent body fat are used. Minimal general standards represent minimally acceptable levels of percent body fat and are based on 10-25% body fat for males and 17-32% for females. Preferred general standards represent optimal levels of percent body fat and are based

Table 4.11 (cont'd)

upon 10-20% body fat for males and 17-25% range for females. Skinfold measures corresponding to these standards are presented in Tables 4.16 and 4.17.

Musculoskeletal Functioning - Musculoskeletal functioning is evaluated using a variety of standards. Minimal and preferred general standards for dominant grip, 15-lb dumbbell press, and bench press are based on 20th and 60th percentile values, respectively, of the Brockport sample of youngsters from the general population (Tables 4.18 and 4.19). These are considered as acceptable and good levels, respectively, of strength and endurance based on expert opinion. Minimal and preferred general standards for the curl-up test (Table 4.22), trunk lift (Table 4.22), correspond respectively to upper and lower values associated with standards for youngsters in the general population. These standards are also considered as minimal and good levels of performance and are associated with Prudential FITNESSGRAM standards. In cases where the shoulder stretch, back saver sit and reach, and Apley test are recommended for a specific subclassification of persons (unaffected limbs), acceptable general standards presented in Table 4.23 are recommended for evaluation. Standards associated with these items reflect acceptable levels of flexibility. No distinction between minimal and preferred general standards are recommended for these items.

As indicated in Table 4.12, selected items on the TST are recommended for various subclassifications. If potential is not limited by an impairment, target scores of 1 or above should be attainable. If an impairment impacts upon extent of movement, the TST may be used to obtain scores which may be used to determine present individualized status and progress. A score of 1 is a minimal general standard reflecting functional range of motion and a score of 2 is a preferred general standard reflecting optimal range of motion.

Table 4.12
Test Item Selection Guide for Youngsters With Congenital Anomalies and Amputations

Fitness Component and Test Item	Selection Guide: Subclassification: One Arm Only	Two Arms Only	One Leg Only	Two Legs Only	One Arm One Leg Same Side	One Arm One Leg Opposite Side
Aerobic Functioning						
Aerobic Capacity						
Select One:						
•One-Mile Run/Walk	R	R				
•PACER	O	O				
Aerobic Behavior						
•Target Aerobic Movement Test (Level I)			R	R	R	R
Body Composition						
Select One:						
•Skinfolds						
Triceps (only)	R	R[1]	R	R	R	R
Sum of Triceps & Subscapular	O	O	R	R	R	R
Sum of Triceps & Calf	R	R	O		O	O
Musculoskeletal Function						
Select One:						
Unaffected Limb(s)						
•Shoulder Stretch or Apley Test (Modified)	R		R	R	R	R
•Back Saver Sit & Reach	R		R		R	
Select if Needed:						
Extent Stretch of Affected Limb(s)						
•TST - Select as needed[4]						
•Knee Extension			O[2,3,6]	O[2,3,6]	O[2,3,6]	O[2,3,6]
•Shoulder Flexion	O[3,6]	O[3,6]			O[3,6]	O[3,6]
•External Shoulder Rotation	O[3,6]	O[3,6]			O[3,6]	O[3,6]
•Elbow Extension	O[3,6]	O[3,6]			R[3,6]	R[3,6]
Must Select:						
•Trunk Lift	R	R				
•Curl-up	R	R				

Table 4.12 (cont'd)

Select One:					
•Dominant Dumbbell Press (Ages 13-17)	R	O	O	R	R
•Bench Press (ages 13-17)		R	R		
•Seated Push-up		R[5]	R[5]		
•Dominant Grip Strength	O	O	O	O	O

1 Selection dependent upon site of anomaly/amputation
2 Optional for below-knee amputation/anomalies of affected limb(s) only
3 Optional in cases where measurement is possible and appropriate.
4 If additional unique range of motion needs are suspected, relevant joints may be tested using the TST.
5 Recommended only for wheelchair users.
6 If potential is not limited by impairment, target scores of 1 or above on the TST are attainable. If impairment impacts extent of movement, the TST may be used to attain scores on which to base individualized status and progress.

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Table 4.13
VO_{2max}, One-Mile Run/Walk, 20m PACER, 16m PACER and Target Aerobic Movement Test General Standards

Age	VO_{2max} (ml/kg/min) M	P	One Mile Run/Walk (min/sec) M	P	20m PACER (# laps) M	P	16m PACER (# laps) M	TAMT[1] M
Males								
10	**42**	52	**11:30**	9:00	**17**	55	**25**	**Pass**
11	**42**	52	**11:00**	8:30	**23**	61	**33**	**Pass**
12	**42**	52	**10:30**	8:00	**29**	68	**40**	**Pass**
13	**42**	52	**10:00**	7:30	**35**	74	**48**	**Pass**
14	**42**	52	**9:30**	7:00	**41**	80	**55**	**Pass**
15	**42**	52	**9:00**	7:00	**46**	85	**61**	**Pass**
16	**42**	52	**8:30**	7:00	**52**	90	**69**	**Pass**
17	**42**	52	**8:30**	7:00	**57**	94	**75**	**Pass**
Females								
10	**39**	47	**12:30**	9:30	**7**	35	**13**	**Pass**
11	**38**	46	**12:00**	9:00	**9**	37	**15**	**Pass**
12	**37**	45	**12:00**	9:00	**13**	40	**20**	**Pass**
13	**36**	44	**11:30**	9:00	**15**	42	**23**	**Pass**
14	**35**	43	**11:00**	8:30	**18**	44	**26**	**Pass**
15	**35**	43	**10:30**	8:00	**23**	50	**33**	**Pass**
16	**35**	43	**10:00**	8:00	**28**	56	**39**	**Pass**
17	**35**	43	**10:00**	8:00	**34**	61	**46**	**Pass**

M = Minimal
P = Preferred

[1] Scored as pass/fail. Youngsters pass when they sustain moderate physical activity for 15 minutes.

Table 4.14
VO_{2max}, One-Mile Run/Walk, 20m PACER Specific Standards for Youngsters Who Are Blind[1]

Males			
		Aerobic Capacity	
Age	Minimal General VO_{2max} (ml/kg/min)	One-Mile Run/Walk (min,sec)	20m PACER (# laps)
10	42	12:30	15
11	42	12:00	21
12	42	11:30	26
13	42	11:00	32
14	42	10:30	37
15	42	10:00	41
16	42	9:30	47
17	42	9:30	51
Females			
10	39	13:30	6
11	38	13:00	8
12	37	13:00	12
13	36	12:00	14
14	35	11:30	17
15	35	11:00	22
16	35	10:30	27
17	35	10:30	32

M = Minimal Standard

[1] These specific standards in the one-mile run/walk and the 20M PACER are based upon a bonus of 10 percentile points given to youngsters who are blind and require physical assistance in performing runs. The VO2max values associated with these specific standards are the same as the minimal general standards.

Table 4.15
VO_{2max} and PACER
Specific Standards for Youngsters with Mental Retardation

Males			
Age	VO_{2max} (ml/kg/min.)[1]	PACER (20m) (# laps) [2,3]	PACER (16m) (# laps) [2,3]
10	38	4	9
11	38	10	16
12	38	16	24
13	38	21	30
14	38	27	38
15	38	33	45
16	38	38	57
17	38	44	59
Females			
10	35	1	5
11	34	1	5
12	33	1	5
13	32	4	9
14	31	6	11
15	31	12	19
16	31	17	25
17	31	22	31

[1] Specific standards associated with a 10% downward adjustment of VO_{2max} from minimal general standards, however, the lap standards for 10- and 11-year old girls represent a slightly higher VO_{2max} value than shown here.

[2] Laps for the 16m are based upon estimates from 20m PACER lap scores.

[3] 16m laps = 1.25 (20m laps) + 3.8, S.E. = 7.4. 20m laps = .71 (16m laps) - .87, S.E. = 5.5. 20m lap values are approximately 63% of 16m lap scores.

Table 4.16
Minimal General Standards for Measures of Body Composition

Age	Percent Fat M		Triceps plus Subscap. Skinfold (mm.) M		Triceps plus Calf Skinfold (mm.) M		Triceps Skinfold (mm.) M		Body Mass Index M	
	U	L	U	L	U	L	U	L	U	L
Males										
10	10	25	11	28	12	33	7	19	15.3	21.0
11	10	25	12	29	12	33	7	19	15.8	21.0
12	10	25	13	30	12	33	7	19	16.0	22.0
13	10	25	13	30	12	33	7	18	16.6	23.0
14	10	25	14	31	12	33	7	18	17.5	24.5
15	10	25	14	32	12	33	7	17	18.1	25.0
16	10	25	15	33	12	33	7	17	18.5	26.5
17	10	25	15	33	12	33	7	16	18.8	27.0
Females										
10	17	32	18	41	20	44	10	24	16.6	23.5
11	17	32	18	41	20	44	10	24	16.9	24.0
12	17	32	18	41	20	44	10	24	16.9	24.5
13	17	32	18	41	20	44	10	23	17.5	24.5
14	17	32	18	41	20	44	10	23	17.5	25.0
15	17	32	18	41	20	44	10	23	17.5	25.0
16	17	32	18	41	20	44	10	22	17.5	25.0
17	17	32	18	41	20	44	10	22	17.5	26.0

L = lower boundary
U = upper boundary

Table 4.17
Percent Body Fat, Skinfold, and Body Mass Index
Preferred General Standards

Age	Percent Fat P		Triceps plus Subscap. Skinfold (mm.) P		Triceps plus Calf Skinfold (mm.) P		Triceps Skinfold (mm.) P		Body Mass Index P	
	U	L	U	L	U	L	U	L	U	L
Males										
10	10	20	11	22	12	26	7	16	15.3	20.0
11	10	20	12	23	12	26	7	16	15.8	20.0
12	10	20	13	24	12	26	7	16	16.0	20.5
13	10	20	13	24	12	26	7	15	16.6	22.0
14	10	20	14	25	12	26	7	15	17.5	23.0
15	10	20	14	25	12	26	7	14	18.1	24.0
16	10	20	15	26	12	26	7	14	18.5	25.0
17	10	20	15	26	12	26	7	14	18.8	25.5
Females										
10	17	25	18	30	20	33	10	19	16.6	21.5
11	17	25	18	30	20	33	10	19	16.9	22.0
12	17	25	18	30	20	33	10	19	16.9	23.0
13	17	25	18	30	20	33	10	19	17.5	23.0
14	17	25	18	30	20	33	10	19	17.5	23.0
15	17	25	18	30	20	33	10	19	17.5	23.0
16	17	25	18	30	20	33	10	18	17.5	23.5
17	17	25	18	30	20	33	10	18	17.5	23.5

L = lower boundary
U = upper boundary

Table 4.18
Dumbbell Press, Push-up, Pull-up, Modified Pull-up
General Standards

Males								
Age	Dumbbell Press # Completed		Push-up # Completed		Pull-up # Completed		Modified Pull-up # Completed	
	M	P	M	P	M	P	M	P
10			7	20	1	2	5	15
11			8	20	1	3	6	17
12			10	20	1	3	7	20
13	14	22	12	25	1	4	8	22
14	19	28	14	30	2	5	9	25
15	21	33	16	35	3	7	10	27
16	24	39	18	35	5	8	12	30
17	27	45	18	35	5	8	14	30
Females								
10			7	15	1	2	4	13
11			7	15	1	2	4	13
12			7	15	1	2	4	13
13	5	12	7	15	1	2	4	13
14	7	14	7	15	1	2	4	13
15	10	16	7	15	1	2	4	13
16	11	16	7	15	1	2	4	13
17	11	16	7	15	1	2	4	13

Table 4.19
Isometric Push-up, Bench Press, Extended Arm Hang, Flexed Arm Hang, Grip Strength
General Standards

Age	Isometric Push-up (sec.)		Bench Press # Completed		Extended Arm Hang (sec.)		Flexed Arm Hang (sec.)		Dominant Grip Strength (kg.)	
	M	P	**M**	P	**M**	P	**M**	P	**M**	P
Males										
10	**40**	40			**30**	40	**4**	10	**18**	22
11	**40**	40			**30**	40	**6**	13	**21**	26
12	**40**	40			**30**	40	**10**	15	**25**	30
13			**20**	34			**12**	17	**29**	35
14			**33**	43			**15**	20	**33**	42
15			**40**	50			**15**	20	**37**	46
16			**47**	50			**15**	20	**43**	51
17			**50**	50			**15**	20	**49**	57
Females										
10	**25**	40			**20**	40	**4**	10	**17**	20
11	**25**	40			**20**	40	**6**	12	**19**	22
12	**25**	40			**20**	40	**7**	12	**22**	24
13			**10**	23			**8**	12	**24**	28
14			**13**	26			**8**	12	**26**	31
15			**14**	27			**8**	12	**29**	33
16			**14**	27			**8**	12	**29**	33
17			**15**	30			**8**	12	**29**	33

Table 4.20
Isometric Push-up, Bench Press, Extended Arm Hang, Flexed Arm Hang, Grip Strength
Specific Standards for Youngsters with Mental Retardation

Age	Isometric Push-up[1] (sec.)	Bench Press[1] # Completed	Extended Arm Hang[2] (sec.)	Flexed Arm Hang[1] (sec.)	Dominant Grip Strength[3] (kg.)
Males					
10	20		23		12
11	20		23		14
12	20		23		16
13		10		6	19
14		16		8	22
15		20		8	24
16		23		8	28
17		25		8	32
Females					
10	13		15		11
11	13		15		12
12	13		15		14
13		5		4	16
14		6		4	17
15		7		4	19
16		7		4	19
17		8		4	19

1 Specific standards reflect a 50% adjustment to minimal general standards.

2 Specific standards are 75% minimal general standards.

3 Specific standards are 65% minimal general standards.

Table 4.21
Reverse Curl, Seated Push-up, 40-meter-Push/Walk, Wheelchair Ramp Test
Specific Standards for Youngsters with Orthopedic Disabilities
(Cerebral Palsy and Spinal Cord Injury)

Males and Females				
Age	Reverse Curl[1] # Completed	Seated Push-up[2] (sec.)	40-meter Push/Walk[3]	Wheelchair Ramp Test (ft.)[5]
10-17	**1**	**5/20**	**Pass** [4]	**8 / ≥15**

1 Specific standard is appropriate for youngsters with low level cervical spinal cord injuries (LLQ).

2 Specific standards are appropriate for youngsters in wheelchairs who have the potential to lift the body (C2-C4, SCI-PW). The 5-second standard should be selected if the functional health concern is with pressure sores and short-term transfer needs. The 20-second standard should be selected if the functional health concern is with longer strength/endurance needs.

3 Specific standard is appropriate for youngsters who self-propel a wheelchair, but who also have some upper body impairment (C2, C3).

4 Youngsters pass when they cover the distance within 60 seconds at the acceptable heart rate intensity.

5 Scores are pass/fail based upon successful negotiation of 8 foot ramps or longer (≥ 15 feet) ramps.

Table 4.22
General Standards for Trunk Lift, Curl-ups and Modified Curl-ups and Specific Standards on the Modified Curl-up for Youngsters with Mental Retardation

Age	General Standards						Specific Standards
	Trunk Lift[2]				Curl-ups and Modified Curl-ups # Completed		Modified Curl-ups[1] # Completed
	L (in.)	L (cm.)	U (in.)	U (cm.)	**M**	P	
Males							
10	9	23	12	30	**12**	24	**7**
11	9	23	12	30	**15**	28	**9**
12	9	23	12	30	**18**	36	**11**
13	9	23	12	30	**21**	40	**13**
14	9	23	12	30	**24**	45	**14**
15	9	23	12	30	**24**	47	**14**
16	9	23	12	30	**24**	47	**14**
17	9	23	12	30	**24**	47	**14**
Females							
10	9	23	12	30	**12**	26	**7**
11	9	23	12	30	**15**	29	**9**
12	9	23	12	30	**18**	32	**11**
13	9	23	12	30	**18**	32	**11**
14	9	23	12	30	**18**	32	**11**
15	9	23	12	30	**18**	35	**11**
16	9	23	12	30	**18**	35	**11**
17	9	23	12	30	**18**	35	**11**

L = Lower boundary of acceptable range
U = Upper boundary of acceptable range

1 Specific standard is 60% of minimal general standard for curl-ups.
2 Scores higher than 12 inches or 30 cm should not be encouraged.

Table 4.23
Shoulder Stretch, Apley, Thomas, Back Saver Sit and Reach, TST
General Standards

Age	Shoulder stretch (P/F)	Apley Test (modified)	Thomas Test (modified)	Back Saver Sit & Reach (in.)	(cm.)	Target Stretch Test M	P
Males							
10	Pass	3	3	8	20	1	2
11	Pass	3	3	8	20	1	2
12	Pass	3	3	8	20	1	2
13	Pass	3	3	8	20	1	2
14	Pass	3	3	8	20	1	2
15	Pass	3	3	8	20	1	2
16	Pass	3	3	8	20	1	2
17	Pass	3	3	8	20	1	2
Females							
10	Pass	3	3	9	23	1	2
11	Pass	3	3	10	25	1	2
12	Pass	3	3	10	25	1	2
13	Pass	3	3	10	25	1	2
14	Pass	3	3	10	25	1	2
15	Pass	3	3	12	30	1	2
16	Pass	3	3	12	30	1	2
17	Pass	3	3	12	30	1	2

Table 4.24
Apley and Thomas
Specific Standards for Youngsters with Cerebral Palsy

Males and Females		
Age	Apley Test (Modified) C1 and C2L*	Thomas Test (modified) C5 and C7 (affected side)
10	2	2
11	2	2
12	2	2
13	2	2
14	2	2
15	2	2
16	2	2
17	2	2

*Refers to CP classification. When these test items are recommended for other classes of cerebral palsy, use general standards.

Chapter V

General Recommendations for Test Administration and Test Items[1]

General Recommendations for Test Administration

In this chapter, test items on the BPFT are presented in detail. As they are presented, specific recommendations for administering test items are often also presented. Although many test items are presented in this manual, generally only four to six test items need to be selected for a particular individual. The following are general recommendations for the administration of the BPFT.

- Practice administering test items and be confident of mastery in administering them before taking formal measurements.
- Develop forms for selecting test items and for recording scores.
- Describe the test to participants and explain what it is intended to assess.
- Have youngsters dress appropriately. Gym suits and sneakers (where appropriate) are recommended.
- Plan and provide general and specific warm-up as appropriate. This is particularly important in instances where flexibility/range of motion and strenuous efforts are involved as test items.
- Provide cool-down activities after testing. This is especially important following aerobic functioning test items.
- Provide a positive testing atmosphere. Encourage youngsters to try their best and continually provide positive reinforcement for effort.
- Compare the performance of participants to criterion-referenced standards rather than with other youngsters.
- Administer no more than one-half of the items in one particular day. If fatigue appears to be influencing performance, provide longer intervals of rest in between test items.
- If tests are administered in a single session, the ACSM (1995) recommends, for accuracy, that components be assessed in the following order: body composition, aerobic functioning, muscular fitness, and flexibility.

[1] The Brockport Physical Fitness Test (BPFT) was designed as a test for youngsters with disabilities which corresponds as closely as possible to health-related criterion-referenced tests for nondisabled youngsters. The BPFT corresponds most closely to the Prudential FITNESSGRAM since that test was adopted by the American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD) as its recommended test for health-related physical fitness. To enhance consistency of test procedures with the Prudential FITNESSGRAM, the procedures for several test items included in the BPFT were modified from: The Cooper Institute for Aerobics Research (1992). The Prudential FITNESSGRAM Test Administration Manual. Dallas, TX: The Author. The test items include the 20m PACER, one-mile run/walk, skinfold measures, body mass index, curl-up, flexed arm hang, pull-up, modified pull-up, push-up, shoulder stretch, trunk lift, and the back saver sit and reach.

- Administer running items on flat and hard yet resilient surfaces.
- Provide opportunity for participants who are blind to become clearly oriented to a test station or testing area. This is particularly important for tests involving running.
- For participants with hearing impairments, provide careful demonstrations. Give instructions in writing or manually (e.g., signing, finger spelling). Use hand signals to start and stop activities.
- Administer the Target Aerobic Movement Test, skinfolds, extended and flexed arm hang, modified pull-up, pull-up, grip strength, bench press, curl-ups, push-walk, reverse curl, seated push-up, trunk lift, the wheelchair ramp test, and most flexibility/range of motion test items individually (e.g., one participant at a time).
- The PACER test, one-mile run/walk, and shoulder stretch may be administered to small groups of subjects at once. However, it may be necessary and most appropriate to provide partners for assistance.
- The following items can be administered to dyads or possibly triads: dumbbell press, isometric push-up, push-ups. Spotters should be provided for the dumbbell press.

Safety Guidelines and Precautions

Test items used in connection with this test (including those that may be nontraditional) are typical of those used elsewhere in physical education or physical fitness programs. Some have appeared on disability-specific tests of physical fitness, tests classifying athletes with disabilities, or are associated with activities of daily living. Although the BPFT is considered to be safe, the possibility that accidents will occur from activity must be recognized. In administering test items, guidelines/precautions presented below should be followed. Also it is important to adhere to guidelines presented in the manual associated with specific test items, as well as other recommended professional practices. In administering this test:

- Administer the test using qualified personnel knowledgeable about physical fitness testing and disability.
- Maximize safety of all youngsters. Professionals using this test should follow policies of their school or agency related to medical information, medical records, and medical clearance for activity. Others should administer this test following approval by a physician who is aware of the health status of the youngster taking the test.
- Avoid administering tests under conditions of unusually high or low temperature and/or humidity or when windy. Youngsters with spinal cord injuries especially may be prone to problems with thermoregulation including overheating.
- Be sure youngsters understand test instructions. Provide opportunities for students to practice test items.
- Terminate the test item if youngsters experience dizziness, pain, or disorientation.
- Avoid comparison of performance among youngsters.
- Spot youngsters where necessary and appropriate.
- Incorporate warm-up and cool-down periods, as appropriate for test items.

- Have youngsters with spinal cord injuries above T6 empty their bowels and bladders and be checked for tight clothing, straps, or pressure sores which might contribute to skin irritation prior to testing. (Individuals with spinal injury above T6 are subject to autonomic dysreflexia, a condition which can dangerously elevate the heart rate and blood pressure as a result of bowel or bladder distension or skin irritation.)
- Be aware that some heart rate monitors may use latex in the strap which may cause allergic reactions. The wearing of the strap may, thus, be contradicted in certain instances.

Age

For purposes of the Brockport Physical Fitness Test, the age of the individual is determined on the date the first test item is administered. Ages are not rounded to the nearest year. Thus, an individual who is 10 years and 1 month old should be identified as 10 years old, and an individual who is 10 years and 11 months old also should be identified as 10 years old.

Aerobic Functioning

PACER Test (20m)

Test Description: In this test, participants run as long as possible back and forth across a 20 meter (21 yards and 31 inches) distance at a specified pace which gets faster each minute. The PACER is designed to measure aerobic capacity. The test is run on a flat, non-slippery surface. Participants run across the area and touch the line by the time a beep from a tape sounds. At the sound of the beep they turn around and run back to the other end. If some participants get to the line before the beep, they must wait for the beep before running the other direction. Participants continue in this manner until they can no longer reach the line before the beep sounds. Participants are allowed to catch up with the pace until they have missed two beeps. Participants who have lost pace should walk from the testing area to a designated cool-down area being careful not to interfere with others who may still be running. Participants just completing the test should continue to walk and stretch in the cool-down area.

Equipment: An audio cassette tape player with adequate volume, audio cassette, measuring tape, marker cones, pencil, and score sheets are required. Participants should wear shoes that prevent slipping. Plan for each participant to have a space 40-60 inches wide for running. The PACER Tape has two music versions and one with only beeps. Each version of the test will give a 5 second count-down (5,4,3,2,1) and instruct participants to "Begin." Cassette tapes are calibrated by using the one-minute test interval at the beginning of the tape. If the tape has stretched and timing is more than +5 or -5 seconds off, obtain another copy of the tape.

Scoring and Trials: One test trial is given. The individual's score is the number of completed laps.

Test Modifications:

- Runners who are blind may run with assistance of a partner, with guide wire or rope assistance, trailing along a wall, or using some other tactual assistance. A short tether rope may be used by partners or persons who are blind may grasp the elbow of a sighted partner. After the method of ambulation is decided, be sure it does not inhibit running performance. For validity, provide the blind runner opportunity to perform optimally. Practice using the selected assistance necessary should be conducted until the runner is comfortable with it.
- In regard to youngsters with mental retardation, be sure that they understand how to perform the test. It is acceptable to take whatever time is necessary to assure that participants learn the test. Since motivation is critical, at least one person should assume the responsibility of providing continual positive reinforcement to runners as they perform the test. Adolescents with mental retardation will often need to run with a tester or test aide. However, these assistants may not pull or push runners or give any other physical advantage to the runner.
- The PACER (16m modified) is the preferred version of the test to be administered to youngsters with mental retardation, ages 10-12, and if they exhibit lower aerobic functioning.
- As participants exhibit increased mastery, the test may be modified so they run laps in the same direction on a track or running surface. This would enhance preparation for long distance running.

Suggestions for Test Administration:

- Mark the 20 meter distance with marker cones and tape line or chalk line at each end.
- Before test day participants should be allowed at least two practice sessions. First allow participants to listen to several minutes of the tape so they know what to expect. It is recommended that practice runs be administered to participants.
- The test tape contains 21 levels (21 minutes). The tape allows nine seconds to run the distance during the first minute. Each minute the pace increases approximately one-half second.
- Single beeps indicate the end of a lap. The participant runs from one end to the other between each beep. Triple beeps at the end of each minute indicate the end of a level and an increase in speed. Participants should be alerted that the speed will increase. **Caution participants not to begin too fast.** The beginning speed is very slow.
- If a participant cannot reach the line when the beep sounds, he/she should be given two beeps to attempt to regain the pace before being withdrawn. If the participant regains the pace, count laps. Give credit for a lap only if the entire 20 meter distance is completed within a lap.
- Volunteers may be asked to assist in recording scores.
- A whistle corresponding to beeps on the tape may need to be used if participants are unable to hear beeps from the cassette.

PACER (16m modified)

The PACER (16m modified) is conducted as described above except the distance to be run is 16 meters (17 yd., 18 in.) rather than 20 meters (21 yd., 31 in.). This modified version is particularly recommended for youngsters with mental retardation and mild limitations in physical fitness.

Target Aerobic Movement Test (TAMT)[2]

Test Description: The test measures the aerobic behavior of youngsters. In this test, youngsters exercise at or above a recommended target heart rate (THR) for 15 minutes. Level 1, the basic level of the test, estimates the ability to sustain a moderate intensity of physical activity (i.e., 70% of maximum predicted heart rate) without exceeding 85% maximum predicted heart rate. Participants can engage in virtually any physical activity as long as the activity is of sufficient intensity to reach a minimum target heart rate (THR) and to sustain heart rate in a target heart rate zone (THRZ). In preparation for this test, instructors are encouraged to work with youngsters to help them identify an appropriate physical activity. For most participants, those who engage in "whole-body" forms of exercise, the THRZ is defined as 70% to 85% of maximum predicted heart rate (i.e., 140-180 beats per minute). There are two exceptions to these general THRZ values. The first is for participants who have a spinal cord injury that results in low level quadriplegia (LLQ) (any spinal lesion between C6 - C8 inclusive). For those youngsters, THRZ may be defined in one of two ways. If a youngster has a resting (sitting) heart rate of less than 65 beats per minute the THRZ is defined as 85-100 beats per minute. If a youngster's resting heart rate is 65 or more beats per minute, the THRZ is defined as a range of 20 to 30 beats above the resting value. As an example, if a youngster has a resting heart rate of 75 beats per minute, the THRZ will be 95-105 beats per minute. The second exception would apply to those who engage strictly in arm exercise. For those who use arms-only forms of exercise the THRZ is 130-170 beats per minute. The tester checks the participant's heart rate at least once every 60 seconds. If participants are within their THRZ and no more than 10 beats above THR, the tester reinforces the behavior and encourages participants to continue at their present intensity of exercise (e.g., "Nice job! Just keep doing what you have been doing at the same speed"). If participants are below their THRZ, the tester encourages the participants to increase their exercise intensity (e.g., "O.K., your heart rate is a little low right now so try to exercise a little harder or a little faster"). Should participants fall below their THRZ they have one minute to regain their minimum value. If they do, the test continues; if not, the test is terminated at that time. If the participant is above the THRZ or more than 10 beats over THR, the tester should acknowledge the participant's effort but also encourage the participant to decrease exercise intensity (e.g., "Wow, you're really working hard, in fact a little too hard. Try to exercise a little lighter or a little slower"). If participants work beyond their THRZ but complete the 15-minute test, their results can be considered as meeting criterion as long as they do not violate lower THRZ requirements. If participants are beyond their THRZ for two or more consecutive minutes and they fail to reach the 15-minute criterion, they should be retested at a later time and encouraged to work at a lower intensity for the purposes of the test.

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[2]This test is a modification of the aerobic movement test developed by Pat Good, Howe School, Dearborn, MI 48124.

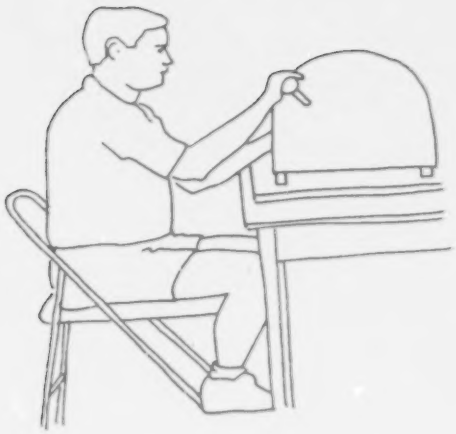


Figure 5.1. Performing the Target Aerobic Movement Test Using Arm Ergometry

Figure 5.2. Performing the Target Aerobic Movement Test

Equipment: It is recommended that testers use an electronic heart rate monitor in administering this test. If a heart rate monitor is not available, a modified procedure is optional using a stopwatch (or a wristwatch with a seconds display). In either case an exercise area large enough for adequate aerobic movement is necessary. It is also recommended that music with a fast tempo be played during the test to provide motivation and a sense of rhythmic, steady-state exercise. Tape, CD, or record players, therefore, are optional pieces of equipment.

Scoring and Trials: One test trial is given. This is a pass/fail test item; participants who can stay at or above the THRZ for 15 minutes pass the test. The 15-minute count does not begin until after the participant enters the THRZ. For those unable to pass the test it is recommended that testers note the length of time that the participant was able to exercise in the THRZ.

Test Modifications:

- If a heart rate monitor is unavailable, the test may be administered using the following procedures. Pulse rate at the wrist (i.e., radial pulse) is counted manually for 10-second intervals at a number of pre-determined checkpoints. (The participant's exercise must be briefly interrupted for each pulse rate check). Pulse rate is checked at the end of a three-minute warm-up period and at the end of each of the following post-warm-up exercise intervals: two minutes, four minutes, six minutes, nine minutes, 12 minutes, and 15 minutes. If youngsters are below the lower boundary of THRZ values at any checkpoint, they should be encouraged to increase the intensity of their exercise and continue the test. If a youngster is below the THRZ for two consecutive checkpoints, however, the test is terminated. Youngsters should be encouraged to maintain a steady exercise pace rather than to fluctuate the exercise intensity. Minimum 10-second THRZ values for the three groups described appear in Table 5.1. Maximum THR values for the three groups also appear in Table 5.1. It is recommended that the test be terminated if youngsters attain the maximum values during warm-up or test periods.

Table 5.1
Minimum and Maximum 10-second Heart Rate Values

	Minimum	Maximum
General	23	30
Quadriplegic (C6-C8)		
Resting HR < 65	14	17
Resting HR > 65	(Resting HR +20)	(Resting HR +30)
	6	6
Arm-only exercise (Paraplegia)	22	28

Participants who are able to exercise within these 10-second pulse rate values for 15 minutes (following a three-minute warm-up) pass the test. If a youngster cannot pass the test, the tester should note the approximate length of time for which the youngster was in the THRZ based on the checkpoints (i.e., at two, four, six, nine, 12 and 15 minutes). If a youngster is below or above the THRZ at one checkpoint, but regains the THRZ at the next checkpoint, the youngster is credited for both checkpoints and the test continues. If, however, a youngster is below the THRZ for two consecutive checkpoints, the test ends, the participant is not credited for either checkpoint, and their score reverts back to the last checkpoint in the THRZ.

- The TAMT may also be used to measure the ability to sustain more vigorous physical activity. However, it is not recommended that higher level intensities be used for persons who exhibit quadriplegia. Table 5.2 summarizes basic test information by levels.

Table 5.2
Minimum THR and THRZ Zone Values for TAMT Levels

Prescribed Level of Intensity	Minimum Predicted Heart Rate Intensity	Minimum THR and THRZ for Whole Body Activity	Minimum THR and THRZ for Arms Only Activity
I Moderate	70%	140 140-180	130 130-170
II Low Level Vigorous	75%	150 150-180	140 140-170
III Vigorous	80%	160 160-180	150 150-170

Suggestions for Test Administration:

- Provide a "cool-down" area and activities of decreasing intensity for participants at the conclusion of the test.
- In many cases it will be necessary to "lead-up" to the test by discussing the procedures with participants and providing training sessions of shorter durations than required by the test. One method would be to start with a 5-minute training session and periodically increase the duration by three-minute intervals until the participants are ready for the full exercise period.
- Individuals with spinal injuries above T6 are subject to "autonomic dysreflexia," a condition which can elevate the heart rate (and blood pressure) as a result of bowel or bladder distension or skin irritation. As a precaution, therefore, it is recommended that youngsters with spinal cord injuries above T6 empty their bowels and bladders and be checked for tight clothing, straps, or pressure sores which might contribute to skin irritation, prior to testing.
- Some participants may wear and require braces during testing. A thoracolumbosacral orthosis (TLSO brace), for example, is a commonly used brace. In regard to bracing, medical personnel need to be consulted to determine whether participation in the specific physical activity is permitted and whether the brace needs to be worn. If a brace is worn, care must be taken to develop an acceptable method for securing a heart rate monitor. For example, in certain instances, it may be possible to loosen the back brace, place the transmitter under the brace, and then tighten the brace to keep the transmitter in place. If it is not possible to use transmitters, the test modification using manual pulse rate counting may be required.

One-Mile Run/Walk

Test Description: In this test, participants complete one mile (1760yd. or 1609m.) in the shortest time possible by running/walking throughout the one-mile distance. The one-mile run/walk is used to measure aerobic capacity. Participants should be instructed to run/walk one mile at the fastest pace possible. The one-mile run/walk can be conducted on a track or any other flat, measured area. Examples of appropriately measured areas would include a regulation track, or a measured rectangle, 35 yds. x 75 yds. (8 laps = 1 mile). Outside fields, playground areas, indoor court areas, or other grassy areas can be measured and marked to serve as appropriate testing areas.

Equipment: Stopwatch, scorecards, pencils, clipboard.

Scoring and Trials: The one-mile run/walk is scored in minutes and seconds. One test trial is given.

***Test Modifications*:**

- Runners who are blind may run with the assistance of a partner. Assistance may include a short tether rope, touching or grasping the elbow of a sighted partner, or sighted partner running alongside the runner who is blind, giving verbal direction and encouragement (See Figures 5.3, A B, and C). Once the method of ambulation is determined, it is important to ensure that it does not inhibit running performance. For purposes of validity, it is important that the runner who is blind be given the opportunity to perform optimally. Practice, using the selected method of assistance, should be continued until the runner is comfortable with it.

Suggestions for Test Administration:

- Provide practice in the run/walk, as necessary, for the required distance prior to the day of testing.
- Following test completion, provide opportunity to "cool down" by walking for several minutes.
- Participants should warm-up properly before walking or running vigorously.
- Warm-up should include stretching exercises.
- It is recommended that youngsters not be tested in environments where the temperature plus humidity is excessive.

(a)

(b)

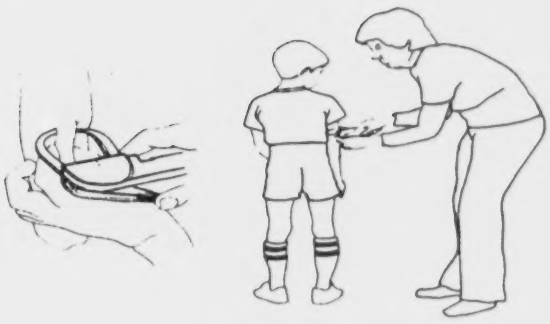
(c)

Figure 5.3. Performing the One-Mile Run/Walk
(a) With a sighted guide
(b) Alone
(c) With guide rope assistance

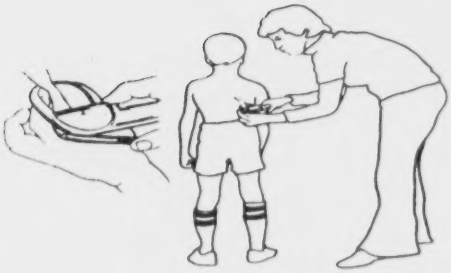
Body Composition

Skinfold Measures

Test Description: This test is given to determine the thickness of a skinfold at selected sites. Skinfold tests are used to estimate the percent body fat of youngsters. Skinfold measures may be taken at three sites: triceps, subscapular, and calf. The triceps skinfold is taken over the triceps muscle at a location midway between the tip of the shoulder and the elbow (See Figure 5.4A). The subscapular skinfold is taken at a site approximately one inch below the tip of the scapula (inferior angle) and one inch toward the midline of the body (See Figure 5.4B). The calf skinfold is taken on the inside of the leg just about the level of maximal calf girth (See Figure 5.4C). The foot should be placed flat on an elevated surface with the knee flexed at a 90 degree angle. These measures should be taken on the participant's dominant or preferred side. Once the sites have been identified, the recommended testing procedure is: (a) grasp the skinfold firmly between the thumb and forefinger and pull slightly from the body being careful to include only subcutaneous fat tissue, not muscle, in the fold (the triceps and calf skinfolds are vertical folds, while the subscapular skinfold is an oblique fold) (See Figures 5.4A, B, and C); (b) place the tips of the caliper slightly above or below (½ inch) the fingers grasping the skinfold; (c) slowly remove thumb pressure from the caliper allowing it to exert full pressure on the fold; (d) record the thickness of the fold to the nearest millimeter once the needle settles (1 to 2 seconds); and (e) open the caliper completely before removing it so as not to pinch the participant.



(a)



(b)

(c)

Figure 5.4. Skinfold Measurements
(a) Triceps
(b) Subscapular
(c) Calf

Equipment: A skinfold caliper of good quality should be used to obtain skinfold measures. The instrument should provide a constant pressure of 10gm/mm^2 on the skinfold.

Scoring and Trials: For each skinfold site used, three measures should be taken. The median (middle) score should be the criterion or recorded score. If a skinfold reading at the same site differs from other readings 2 mm. or more, an additional measure should be taken and the measure, which is substantially different, should be deleted.

Test Modifications:

- Measurements should not be taken at sites with scar tissue, where subdural and/or intramuscular injections have been repeatedly received, or on limbs that have muscular atrophy. In certain instances, it may not be possible to attain skinfold measures at a site.

Suggestions for Test Administration:

- It is recommended that testers master administering the skinfold test prior to test administration.
- Testers can help distinguish muscle and fat by having participants tense and relax the triceps muscle.
- The subscapular skinfold is an oblique fold which is in line with the natural cleavage lines of the skin. Testers may be aided in finding the line by having subjects bend their arm at the elbow and placing the arm on the back so the back of the hand touches the spine while standing. The top of the fold should be medial to the bottom of the fold.
- When measuring the subscapular skinfold of a female, it is recommended that the individual being tested wear a thin t-shirt or similar garment. The shirt can be raised to allow access to the skinfold site or the measurement can be taken over the shirt. In such an instance, it would be necessary to subtract the fold of the t-shirt. For females wearing a bra, the strap need only be pushed upward 2-3 inches to allow the measurement. If possible, female subjects should be tested by females.
- It is recommended that one measurement be taken at each site before taking second and third measurements at a site.

Body Mass Index (BMI)

Test Description: Whereas skinfolds provide an estimate of body fatness, body mass index reflects muscle and bone mass and provides an indication of the appropriateness of an individual's weight relative to height. In order to compute BMI, height and weight must be determined.

Equipment: A scale is a required piece of equipment and a stadiometer is preferred. If a stadiometer is unavailable, a marked wall or type measure can be used to determine height (or body length).

Scoring and Trials: Only one trial is necessary to determine both height and weight. Participants should wear lightweight clothing with shoes removed (when possible) for height and weight measurements. Initially height can be rounded to the nearest half-inch and weight to the nearest pound. BMI can be determined by using the chart in Appendix B or by using the following equations:

$$\text{BMI} = \frac{\text{Body Weight (kg)}}{\text{Height}^2\text{ (m)}} \quad \text{or} \quad \frac{704.5 \times \text{Body Weight (lb.)}}{\text{Height}^2\text{ (in.)}}$$

1 kilogram = 2.2 pounds (to compute kg. from lbs.; divide total pounds by 2.2)
1 meter = 39.37 inches (to compute m. from in.; divide total inches by 39.37).

For example, the BMI of a 170 lb. person who is 5'10" in height is 24.

Computation: $\text{BMI} = \frac{170 \text{ lb.}}{2.2} = \frac{77.3}{\frac{70 \text{ inches}}{39.37}} = \frac{77.3}{1.78} = 24$

$\text{BMI} = \frac{704.5\,(170)}{70^2} = \frac{119765}{4900} = 24$

Test Modifications:

- **Height:** In cases where individuals wear prosthetic devices or braces, height should be taken while wearing these devices. When individuals are unable to support their body weight in a standing position, body length may be measured by having subjects lie on a mat and using a tape measure. If a youngster with cerebral palsy cannot stand erect because of exaggerated flexor tone in the hips or knees the tester may use a tape measure to measure body segments (i.e., floor to knee, knee to hip, hip to head) and add the segments to determine body length for the purpose of calculating BMI.

●**Weight:** When determining weight of individuals who wear prosthetic devices or braces, weight is taken with braces and prosthetic devices removed, or by subtracting the weight of such braces or prosthetic devices. Weight of individuals using wheelchairs may be determined by either taking the individual out of the wheelchair and determining weight, or weighing the individual while in the wheelchair and subtracting weight of the wheelchair from weight of the individual in the wheelchair. In the case of individuals with amputations or congenital anomalies, the individual may be weighted; however, care must be taken when making comparisons with other persons. When estimating the weight of an amputee, add 1/18th of body weight for a below knee amputation, add 1/9th of body weight for an above knee amputation, and 1/6th of body weight for a hip amputation.

Suggestions for Test Administration:

●If determination of either height or weight poses a safety problem to subject or tester, or if anomalies, amputations, or contractures prohibit valid measurement, or if BMI is a measure which will not be used for program planning, this test may be waived.

Musculoskeletal Function

Muscular Strength/Endurance

Bench Press[3]

Test Description: In this test, participants attempt to perform as many bench presses as possible (to a maximum of 50 for males and 30 for females). The test is designed as a measure of upper extremity (particularly elbow extensor) strength and endurance. In this test, the participant lies supine on a bench with knees bent and the feet placed on the floor or on a rolled mat on each side of the bench. Individuals not able to assume this position should lie on the bench with knees flexed and lower extremities secured or supported. The teacher acts as a spotter or has spotters available for safety (See Figure 5.6). The participant grasps a 35-lb. barbell with both hands directly above the shoulders with elbows flexed; this is the "ready" position. Hands on the bar should be about shoulder width apart with thumbs wrapped around the bar. On command, the participant raises the barbell to a straight arm position at a 90 degree angle to the body (See Figure 5.5) and returns to the ready position. The participant repeats this action without rest until the barbell cannot be raised any longer, or until 50 repetitions for males, or 30 repetitions for females have been successfully completed. One repetition should be completed every 3 to 4 seconds at a steady pace. Spotters stand beside and adjacent to the rib cage, rather than behind the participant so the participant is encouraged to lift the barbell straight upward. Although a bilateral action with both arms is encouraged, participants are credited with a successful repetition if the barbell touches the chest and both arms eventually end up in a straight arm position without rest. The tested participant is encouraged by the teacher through praise and counting of repetitions.

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[3] This test item and procedures for testing were taken and/or modified from: Johnson, R.E., and Lavay, B. (1989). "Fitness Testing for Children with Special Needs: An Alternative Approach." Journal of Physical Education, Recreation, and Dance, 60(6), p.50-53.

Figure 5.5. The "up" Position in the 35-lb Bench Press

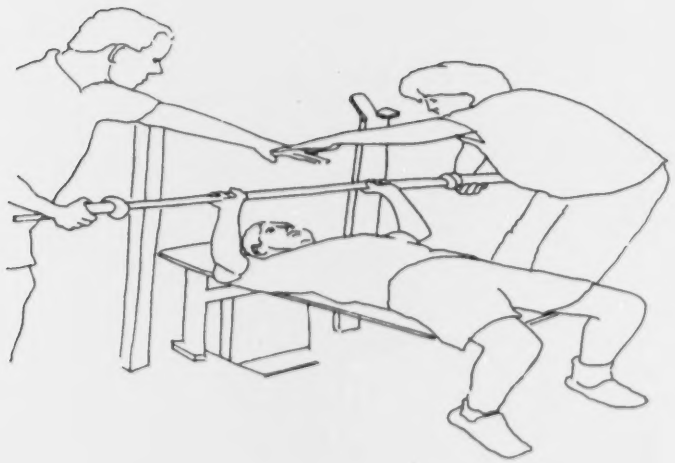

Figure 5.6. Spotting and Setting an Upward Target for the Bench Press

Equipment: Bar, bells and free weights that weigh thirty-five pounds (35 lbs.) (taken together). A sturdy bench for performing the bench press is recommended.

Scoring and Trials: Bringing the barbell from the chest to the straight arm position represents one correct bench press. Record the number of correct bench press repetitions performed. Males stop at 50 and females stop at 30 correct repetitions.

Test Modifications:

- With regard to subjects with mental retardation and mild limitations in physical fitness, be certain they understand how to perform the test. It is essential to take whatever time is necessary for the participant to learn the test.
- Subjects taking this test should have the upper body ability to perform the test. Provide those with lower body disability safe and stable support while assuming the supine position on a bench. For stability, participants may be held or secured as necessary and appropriate.

Suggestions for Test Administration:

- Conduct practice sessions with participants to help them understand the proper method for performing the bench press. Stress safety in a positive manner through demonstrations.
- Demonstrate and let participants experiment with the proper method of performing the bench press with a broomstick, the bar only, with the bar and lighter weights, then finally with the 35-pound weight, bar and barbells. At the same time, demonstrate and let participants experience the proper lying position on the bench, hand position on the bar, leg and foot position, and correct arm movement. Setting an upward target (see Figure 5.6) will enhance proper upward movement of the bar. Give positive reinforcement for properly executed positions and movements. Do not test a participant who does not understand how to complete a properly performed repetition of the bench press.

Curl-up

Test Description: In this test, participants complete as many curl-ups as possible, up to a maximum of 75, at a cadence of one curl every three seconds. This test is designed to measure abdominal strength/endurance. For the curl-up test, the participant starts by lying in a supine position on a mat. The knees are bent at an angle of approximately 140 degrees, with the feet flat on the floor and the legs slightly apart. The arms are held straight, parallel to the trunk with the palms facing downward toward the mat, and the fingers are stretched. The participant is positioned on a mat so that a measuring strip can be touched with the outstretched fingers. (If the measuring strip is moveable, it can be moved to the appropriate position) (See Figures 5.7 and 5.8). The important factor is that individuals move the fingertips 4 ½" as part of the test. From the starting position, the participant curls up slowly sliding the fingers across and to the opposite side of the measuring strip. The participant then returns to the starting position (See Figures 5.7 and 5.8). A test administrator should call the cadence (about one curl every 3 seconds). The participant continues without pausing until the pace cannot be met, the participant no longer continues, or the completed number of 75 has been reached.

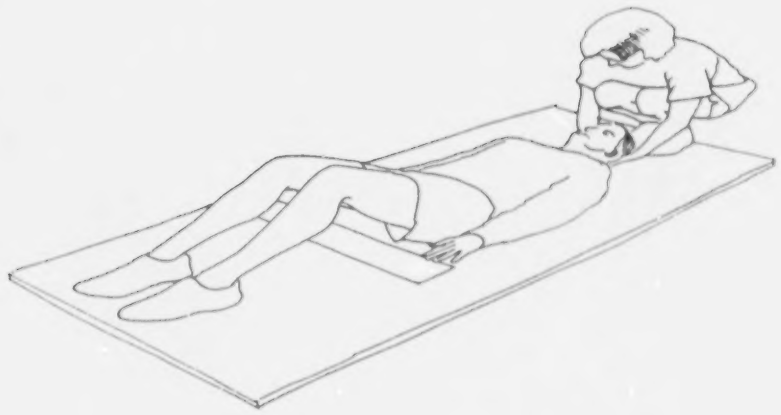

Figure 5.7. Starting Position for the Curl-up Test

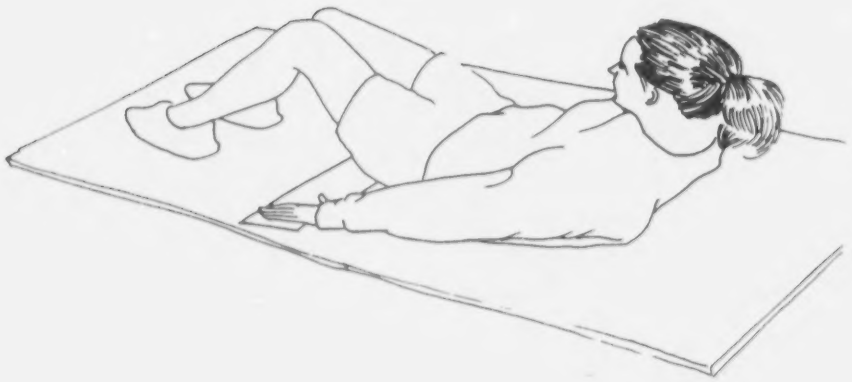

Figure 5.8. "Up" Position for the Curl-up Test

Equipment: A gym mat and a measuring strip 30" x 4 ½" are used in the test. The measuring strip can be held or secured to a supporting surface. Although measuring strips made from cardboard or sanded plywood are recommended, other systems for measuring the 4 ½" are acceptable. For example, tape markers may be placed on a mat to indicate start and finish points.

Scoring and Trials: One trial is administered. An individual's score is the number of curl-ups performed correctly. One curl-up is counted for every return to a supine position on the mat. Curl-ups should not be counted if the feet completely leave the floor at any time during the movement, if the participant does not reach the required distance or return to the start position, or performs the curl-up in any other incorrect manner.

Test Modifications: In regard to youngsters with disabilities it is acceptable to take whatever time is needed to assure that participants know how to perform the test. Motivation is critical, therefore, continual positive reinforcement should be provided throughout testing. Some youngsters are negatively affected by bringing the head back in contact with assistant's hands. This procedure may be eliminated if the participant is able to bring the head back gently on a suitably safe support surface.

Suggestions for Test Administration:

- Encourage a slow curling of the upper spine during the curl-up.
- Encourage a steady, controlled, and continuous movement.
- It may be necessary for an assistant to be used to secure the measuring strip.
- Time can be saved by taping a measuring strip to a large mat and adjusting the participant's starting position to the measuring strip.
- A testing assistant may be used to curl their hands on the mat so that the participant returning the head to the mat during the curl-up may be guided to the appropriate down position.

Curl-up (Modified)

The curl-up (modified) is performed following the procedure recommended for the curl-up with the following exceptions:

1. The hands are placed on the anterior aspect of the corresponding thighs rather than on the mat alongside the body.

2. As the participant curls-up, the hands slide along the thighs until the fingertips contact the patellae (See Figure 5.9). (The hands should slide approximately four inches to the patellae or beyond, if necessary.)

3. If necessary, testers can place their fingertips in contact with the youngster's kneecaps to provide a more tangible target for the youngster's reach (See Figure 5.10).

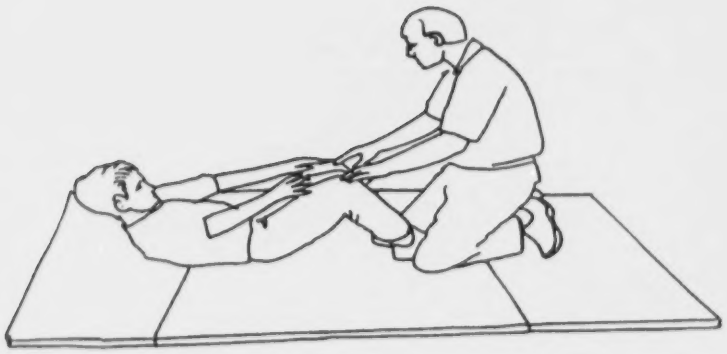

Figure 5.9. Setting a Target for the Modified Curl-up Test

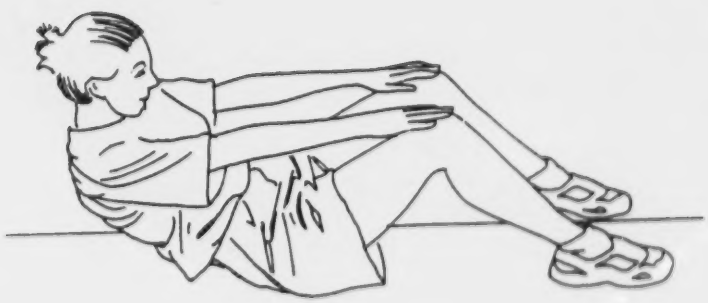

Figure 5.10. The Modified Curl-up

Dumbbell Press

Test Description: In this test the participant lifts a 15-lb dumbbell as many times as possible up to 50 repetitions, in a specific cadence. The test is designed to measure arm and shoulder strength and endurance. The participant is seated in either a wheelchair or other sturdy chair (See Figure 5.11). The teacher serves as a spotter or has spotters available for safety. The participant is given and grasps with the dominant hand the 15-pound dumbbell with the elbow flexed so that the weight is close to and in front of the dominant shoulder. Once participants have control of the weight they should extend the elbow and flex the shoulder so that the weight is lifted "straight up" and above the shoulder. When the elbow is completely extended the participant returns the weight to the starting position. The exercise is continued at a steady pace (approximately 3 to 4 seconds per repetition) until the participant is unable to lift the weight above the shoulder with complete elbow extension.

Figure 5.11. The 15-lb. Dumbbell Press Test

Equipment: A 15-pound dumbbell, a stopwatch, and either a wheelchair or other sturdy chair (wood or metal would be preferred) are required for this test.

Scoring and Trials: The participant receives one trial only. One successful lift is counted each time the dumbbell is raised above the shoulder with complete elbow extension. The scoring ends when the participant is unable to lift the weight with complete elbow extension or when the participant rests for more than four seconds between repetitions. Stop the test if and when 50 repetitions are performed.

Test Modifications:

- The test can be administered within the participant's range of motion. If complete elbow extension is not possible due to impairment, the scorer should record a successful lift each time the participant achieves his/her maximum elbow range of motion with the weight.
- In administering the test, emphasis should be given to a steady pace. If a participant, because of a disability, requires more than 3 to 4 seconds to complete a repetition, this should be permitted as long as the participant is "working".

Suggestions for Test Administration:

- Prior to testing, be sure the participant understands how to execute the movement.
- Provide continued encouragement throughout the test.
- Match counting with a cadence. For example, saying "one and down," "two and down," etc. can be matched to a cadence of about one repetition every 3-4 seconds.

Extended Arm Hang

Test Description: In this test, the participant hangs from a bar or similar hanging apparatus for as long as possible for up to 40 seconds. The test is designed to measure hand, arm, and shoulder strength and endurance. The participant begins by grasping the bar using an overhand or pronated (knuckles toward the face) grip (See Figure 5.12). The thumb should be wrapped around the bar. The participant may jump to this position, be lifted to it, or move to it from a chair. The individual must assume a fully extended position with feet clear of the floor throughout the test. Elbows and knees must not be bent. The participant may be steadied so that swaying does not occur.

Equipment: This test item requires an adjustable bar about 1 ½ inches in diameter and a stopwatch.

Scoring and Trials: One trial is permitted for each participant. One's score is the elapsed time in seconds (to the nearest second) from the start of a free hang to the time that the fingers leave the bar.

Test Modifications:

- Individuals with disabilities must be provided an opportunity to learn and experience the test item before scores are recorded for testing purposes.

Suggestions for Test Administration:

- Be sure that the bar and hands are dry.
- Constant encouragement throughout the test is extremely important.
- Because some youngsters may be afraid of falling, it is important to keep them as close to the floor or ground as possible. Gently steadying youngsters and telling them they will be assisted if they fall is recommended.

Figure 5.12. The Extended Arm Hang Test

Flexed Arm Hang

Test Description: In this test, the participant attempts to maintain a flexed arm position while hanging from a bar for as long as possible. The test is designed to measure hand, arm, and shoulder strength and endurance. The participant should grasp the bar with an overhand grip and be assisted to a position where the body is close to the bar and the chin is clearly over, but not touching, the bar. The participant attempts to hold this position for as long as possible. The body may not swing, the knees may not be bent, and the legs may not kick during the performance of the task. If a physical disability prohibits grasping, the bearing of weight, or reasonable execution, this item should not be administered.

Equipment: This test item requires a pull-up bar about 1.5 inches in diameter which is at a height exceeding the height of the participant, preferably no more than 3 feet and no less than 1.5 feet above the participant's standing height. It is recommended that a gym mat be placed under the bar. A stopwatch is required.

Scoring and Trials: Each participant receives one trial. The tester records the length of time (to the nearest second) that the participant can maintain the flexed arm hang position. Timing stops when the head tilts back or the chin contacts or drops below the bar.

Suggestions for Test Administration:

- A spotter may use an "arm bar" across the participant's thighs to restrict unwanted movements.
- Be sure participants understand how to perform the test before taking a score. Provide sufficient time for participants to learn the activity.

Dominant Grip Strength[4]

Test Description: In this test, participants attempt to squeeze a grip dynamometer to generate as much force as possible in the stronger upper extremity. The test is designed to measure hand and arm strength. The participant should be seated on a straight-back, armless chair, with feet flat on the floor. The tester must first adjust the handle of the dynamometer so it "fits" the hand of the participant. When the dynamometer is squeezed, the second phalanx should rest on the adjustable handle. Once the dynamometer has been adjusted to the correct position, the participant should be instructed to squeeze the handle as hard as possible (See Figures 5.13 and 5.14). The hand grasping the dynamometer should be held away from the body and the chair while the test is being performed.

Equipment: A JAMAR grip dynamometer (or equivalent dynamometer) with an adjustable handle is necessary to conduct this test.

Scoring and Trials: The tester records each participant's score to the nearest kilogram. The needle should be reset to zero after each trial. The middle score of the three trials will serve as the criterion measure. Allow at least 30 seconds between trials.

Test Modifications:

- Individuals without functional strength or those unable to grasp or release because of impairment should not be administered the dominant grip strength test item.
- Participants may be seated in a wheelchair or other support surface as long as the test can be administered appropriately.

Suggestions for Test Administration:

- All participants must be motivated positively to enhance maximum effort.
- Do not test subjects until they have learned to perform the test properly.
- Individuals who are mentally retarded must be provided an opportunity to use the equipment and be taught the concept of squeezing as forcefully as possible.

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[4]This test item and procedures for testing are taken and/or modified from Winnick, J.P., and Short, F.X. (1985). Physical Fitness Testing of the Disabled. Champaign, Human Kinetics.

Figure 5.13. The Dominant Grip Strength Test

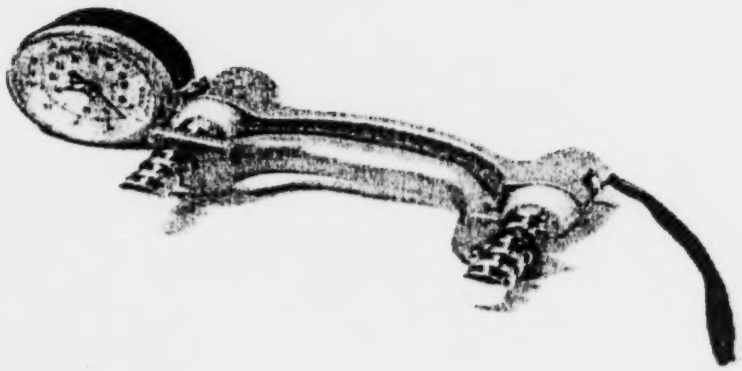

Figure 5.14. A Grip Dynamometer

Isometric Push-up[5]

Test Description: In the isometric push-up, participants attempt to hold the "up" position in a push-up for up to 40 seconds. This test is designed primarily to measure the strength and endurance of the upper body. A front leaning rest position is taken with the hands directly below the shoulders, arms extended, the whole body in a straight line, and toes touching the floor or mat (the correct "up" position for a push-up) (See Figure 5.15). The test is terminated when any movement such as bending, sagging or swaying, occurs at the elbows, shoulders, trunk or knees. In other words, scoring is terminated when the correct "up" position for the push-up is no longer held.

Equipment: A stopwatch and a flat solid surface are needed.

Scoring and Trials: One test trial is used. The tester records the length of time (to the nearest second) that the participant holds the proper position. One test trial is used.

Suggestions for Test Administration:

- Do not test a participant who does not understand how to complete a properly executed isometric push-up position.
- It is essential to take whatever time is necessary to insure that participants learn the test.
- Since motivation is critical, it is important that at least one person assume responsibility for providing continual positive reinforcement to each participant.
- Demonstrate and let participants experiment with the proper method of performing an isometric push-up. Demonstrate and let participants experience the proper hand, arm, head, trunk, leg and foot position. Give visual, verbal, and physical support prompts to help the participant learn the correct position. Physical supports during testing are not permitted.
- It is permissible to provide tactual assistance to help place and keep the body in the proper position during the test. However, no assistance should be given in holding the body upright.

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[5] This test item and procedures for testing were taken and/or modified from: Johnson, R.E., and Lavay, B. (1989). "Fitness Testing for Children with Special Needs: An Alternative Approach." Journal of Physical Education, Recreation, and Dance, 60(6), p.50-53.

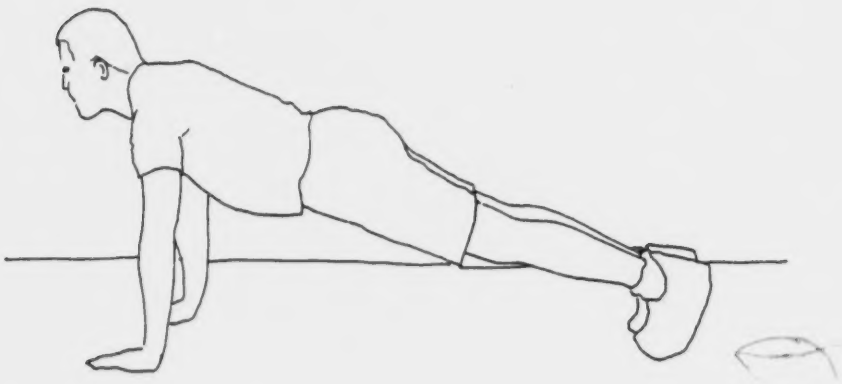

Figure 5.15. The Isometric Push-up Test

Pull-up

Test Description: In this test, participants are to complete as many pull-ups as they can. The test is designed to measure upper body strength and endurance. The participant begins from a straight arm hanging position from a bar using the overhand pronated grip. The individual then pulls the body up toward the bar until the chin is above the bar (See Figures 5.16A and B). Once this position is reached, the body is lowered to the full hanging starting position. The body may not swing, the knees may not be bent, and the legs may not kick during the performance of the task.

Equipment: A sturdy horizontal bar about 1.5 inches in diameter which permits the participant to hang with arms fully extended and feet not touching the floor is used.

Scoring and Trials: Each participant is permitted one trial and the score attained is the number of pull-ups performed. There is no time limit for the test but participants should be encouraged to complete the test quickly to reduce the effects of fatigue.

Test Modifications:

- Testing assistants may need to spot participants to reduce the possibility of falling and losing balance.

Suggestions for Test Administration:

- Be sure participants understand how to perform the test before taking a score. Provide sufficient time for participants to learn and perform the item with confidence.
- Spotters may use an "arm bar" across the participant's thighs to restrict swinging of the body, kicking during the task, or other unwanted movements.

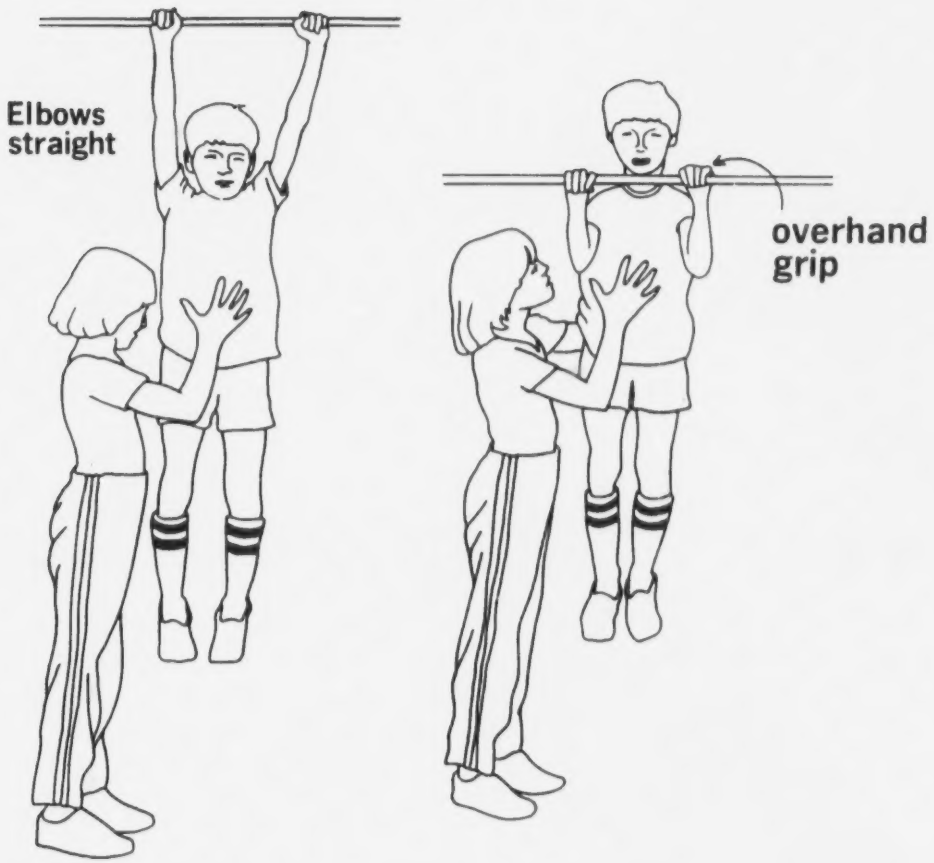

Figure 5.16. The Pull-up Test
(a) Down position
(b) Up position

Pull-up (Modified)

Test Instructions: In this test, participants attempt to execute as many pull-ups as possible using a pull-up stand. The test is selected as a measure of upper body strength and endurance. For the test, a modified pull-up apparatus is used (See Figure 5.17 and 5.18). The participant lies down under the crossbar, which is directly over the shoulders. The participant's arms are extended upward toward the bar. The bar should be set 1-2 inches above the participant's outstretched arms. An elastic band is placed on a peg 7-8 inches below the bar. This band marks the height to which the participant's chin must rise for completion of one repetition.

To get into the starting position, the participant raises the body high enough to grasp the bar, using an overhand grip (palms away from the body) with thumbs around the bar. The pull-up begins in the "down" position, with arms, legs and body straight, buttocks off the floor, and only the heels touching the floor.

The pull-up action should raise the body to a height where the chin rises above the elastic band. Then the participant returns to full extension and repeats as many times as possible. Movement is performed using the arms only.

Equipment: A modified pull-up stand is preferred. However, any adjustable high bar arrangement may be used as long as procedures are followed.

Scoring and Trials: The number of correct pull-ups completed is the score. There is no time limit, but the action should be continuous.

Test Modifications:

- Participants with disabilities should be given sufficient practice to learn the test procedure.

Suggestions for Test Administration:

- Encouragement and positive feedback should be given throughout the test.
- Stop the test if the participant experiences extreme discomfort.

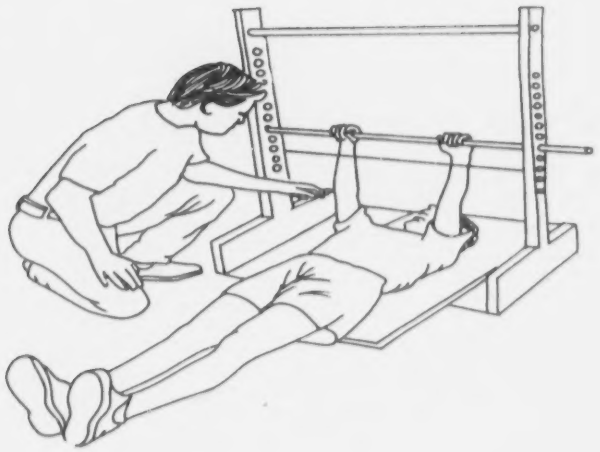

Figure 5.17. Modified Pull-up Starting Position

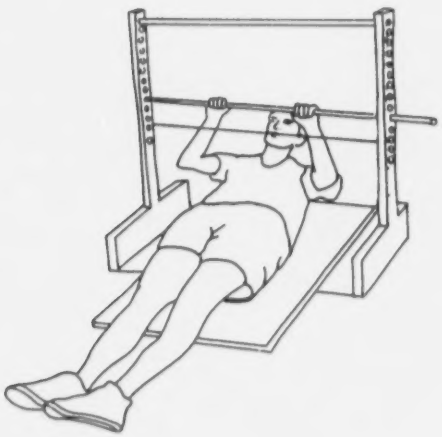

Figure 5.18. Modified Pull-up Raising Position

Push-up

Test Description: In the push-up, participants complete as many push-ups as possible at a cadence of one push-up every three seconds. The test is designed primarily to measure upper body strength and endurance. To begin, the participant assumes a prone position on a mat with hands placed under the shoulders, fingers stretched out, legs straight and slightly apart, and weight on tucked toes. The participant pushes to the up position until arms are straight. The participant lowers the body by bending the elbows to a 90 degree angle (the angle formed by the upper and lower arms). The participant then returns to the straight arm position.

***Equipment*:** Only a mat is required. A watch with a second hand, a metronome, or a tape with the correct cadence is recommended to keep cadence. Cadence can also be called out.

***Scoring and Trials*:** After learning the test, one trial is permitted. A participant's score is the number of correctly executed push-ups. The start of the push-up is the up position with arms straight. When the individual bends the arms and returns to the arm straight position, one push-up is counted. The test is terminated if participants are unable to maintain correct cadence, stop to rest, or discontinue the activity. Push-ups done incorrectly should not be counted. Incorrect push-ups occur if knees touch the floor, arms are not straight in the up position, arms are not bent to 90 degrees on the downward movement, movement is jerky or not coordinated bilaterally, or the back is not kept to a reasonably straight position.

Test Modifications:

- If this test item is used with individuals with mental retardation, time should be provided for participants to learn the test. It is recommended that some flexibility may be given in regard to performance to a cadence.
- Considerable time will be required to teach the test to individuals with visual disabilities if they have not already learned how to perform the item. Provide tactual/kinesthetic cues to help youngsters know correct arm positions and realize a straight back during the push-up.

***Suggestions for Test Administration*:**

- Be sure all participants have time to learn and perform the test item correctly.
- Encourage participants to breathe as they perform the activity. Preferably, participants exhale while raising to the up position.
- To enhance learning the push-up, have participants watch themselves in a mirror. This is especially important in learning the bend to 90 degrees and keeping the back straight in the up position.
- Practice with a cadence.

Push/Walk (40m)

Test Description: Participants walk or push their wheelchair a distance of 40 meters (with a 5-meter start zone) at a speed that is "comfortable" for them. This test item is designed to measure if participants have the strength and endurance to transverse a distance of 40m (43yd. 25in.) below a moderate level of exertion. This is not a "dash" or a "race" and testers should not emphasize high speed as a component of this test. Youngsters should be encouraged to travel at a speed that they usually use for community mobility. To pass the test, participants must be able to cover the 40-meter distance in 60 seconds or less while keeping the heart rate below the criterion for "moderate" exercise intensity (See Figures 5.19 and 5.20).

Equipment: A watch with a second hand or stopwatch is necessary for this test. The test should be conducted on a hard, flat, smooth surface. A start line is placed 45 meters from a finish line and a "time line" is placed 5 meters from the start line (See Figure 5.19).

Scoring and Trials: Participants are timed to the nearest second over the 40-meter distance. Testers begin timing as the youngster crosses the time line and stop timing when the youngster crosses the finish line. Immediately upon crossing the finish line, testers measure the youngster's radial pulse for 10 seconds. To determine the level of intensity, participants who walk or push their wheelchair with their legs must have a post-test 10-second pulse rate less than 20 beats. Youngsters who push their wheelchair with their arms must have a post-test 10-second pulse rate of 19 or less. Two trials may be administered, if necessary. If two trials are used, permit at least a one-minute rest period between trials. Pulse must be at or near resting level before a trial is administered. The test is assessed on a pass/fail basis. Participants pass when they cover the distance within 60 seconds at the acceptable heart rate intensity.

Test Modifications:

- If testers experience difficulty obtaining a manual radial pulse, it is recommended that a stethoscope be used to determine heart rate.
- Testers also can choose to use a heart rate monitor rather than taking a manual radial pulse. If a monitor is used, it should be read within 5 seconds after the youngster crosses the finish line. For youngsters who walk or push their wheelchair with their legs, the post-test heart rate on the monitor must be equal to or less than 125. For participants who propel their chairs with their arms, the rate must be 115 beats per minute or less.

Test Suggestions:

- If a youngster covers the distance in less than 60 seconds, but the heart rate is too high, provide a rest, instruct the youngster to go slower, and re-test.
- Testers should not use "on your mark, get set, go," or similar terminology to start the test. Instead, youngsters should start when they are ready and testers should begin timing as they cross the time line.

• Although not a preferred procedure since it is believed to be less accurate, testers may use self-perceived exertion and/or tester observation of exertion as ways of reflecting below moderate effort in completing the test. For example, individuals able to carry on a conversation comfortably or indicating that the activity was at a "light" exertion level, might be considered to have exercised below a moderate level of intensity.

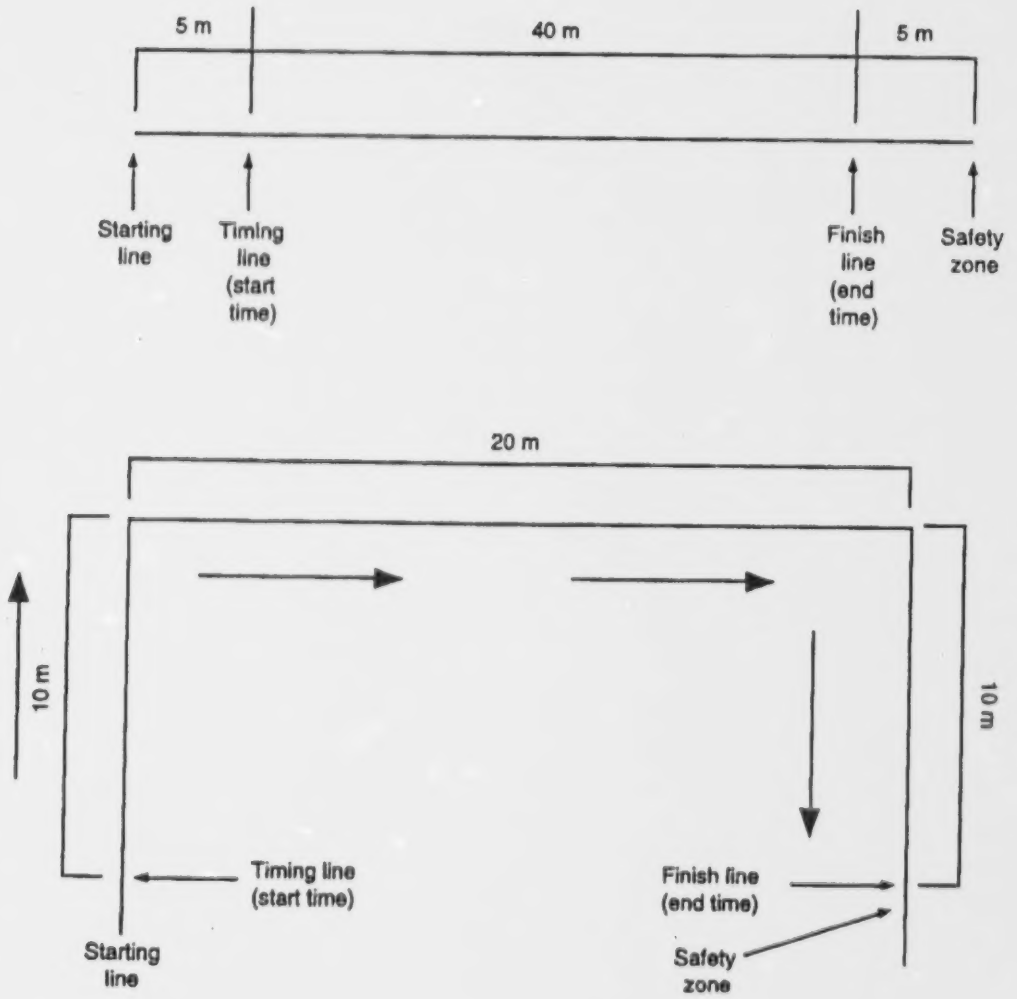

Figure 5.19. Acceptable Courses for the 40m Push/Walk

Figure 5.20. Performing the 40m Push/Walk

Reverse Curl (1 lb.)

Test Description: For the reverse curl, the participant attempts to pick up a one-pound dumbbell with the preferred arm while assuming a seated position in a chair or wheelchair (See Figure 5.21). The test is designed as a measure of hand, wrist, and arm strength. During the movement, the fingers are flexed, i.e., wrapped around the one pound weight, and the forearm is pronated at the start and throughout the movement. The movement is primarily executed by extension of the wrist and flexion of the elbow. It starts with the weight resting on the midpoint of the ipsilateral thigh while in a normal seated position. From this starting position, the participant flexes the elbow until the weight is lifted to a position where the elbow is flexed to at least 45^0. The weight is held in this position for two seconds, and then is returned eccentrically to the starting position. The movement must be controlled and the elbow extension on the downward movement must be slower than gravitational pull.

Equipment: A one-pound soft-iron dumbbell is recommended.

Scoring and Trials: One trial is administered. Bringing the dumbbell from the thigh to the flexed arm position, holding it at the flexed position for two seconds, and returning it to the knee represents one correct reverse curl. The test item is passed if the participant can perform 1 correct reverse curl.

Test Modifications:

- A table or other support surface may be used for a starting support surface in place of the thigh. If used, the support surface should be at a seated knee level.
- One pound weights other than dumbbells may be used if the testing procedures can be essentially reproduced.

Suggestions for Test Administration:

- Permit participants to practice the test before the actual test is formally administered.
- Provide a positive environment and reinforce positively for good effort, proper execution, and successful completion of the task.

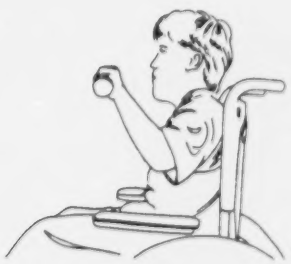

Figure 5.21. Performing the Reverse Curl

Seated Push-up

Test Description: In this test, participants attempt to perform a seated push-up and hold for up to 20 seconds. The test is designed to measure upper body strength and endurance. Participants place their hands on the handles of push-up blocks (see Figure 5.22), or the armrests of a wheelchair (or an armchair), and lift the body so that the buttocks are raised from the supporting surface by extension of the elbows. Once extension is obtained, the participant attempts to maintain that position for as long as possible. Arms must be extended at the elbow.

Equipment: A stopwatch and either a standard wheelchair with arm rests, a sturdy armchair, or a set of push-up blocks are required for the test. The arm rests or the push-up blocks should be slightly more apart than the shoulder width of the participant.

Scoring and Trials: The participant receives one trial only. The score is the length of time the participant can hold the body out of the seat of the wheelchair with elbow extension. Feet can come in contact with the floor but cannot be used to assist in the performance of the push-up. Timing begins when the participant raises the body and obtains elbow extension. Timing ends when the participant is no longer able to hold the position or when a maximum of 20 seconds is reached.

Test Modifications:

- The test can be administered within the participant's range of motion. If the participant is unable to completely extend the elbows due to an impairment, timing should begin when the participant achieves his/her maximum extension and end when the maximum extension can no longer be held.

Suggestions for Test Administration:

- Care must be taken to be sure that participants are in the correct position for testing.
- If using push-up blocks, it is recommended that the blocks be stabilized by testing assistants. This will prohibit the blocks from tipping during the test.
- Permit participants an opportunity to practice.

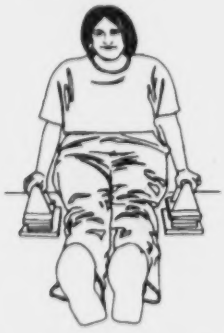

Figure 5.22. The Seated Push-up

Trunk Lift

Test Description: In this test item, the participant attempts to lift the upper body up to 12 inches (30 cm.) off the floor using muscles of the back and hold the position to allow for measurement. The test is designed to measure trunk extension, strength and flexibility. The participant being tested lies on the mat in a prone position (face down). Toes are pointed and hands are placed under the thighs. The participant lifts the upper body off the floor to a maximum height of 12 inches (See Figure 5.23). The movement should be performed in a very slow and controlled manner with the chin parallel to the floor. The position is held long enough to allow the tester to place a ruler on the floor in front of the participant and determine the distance of the participant's chin from the floor. The ruler should be placed at least an inch to the front of the participant's chin and **not directly under the chin**. Once the measurement has been made, the participant returns to starting position in a controlled manner.

Equipment: Gym mats and a yardstick or ruler are needed.

Scoring and Trials: Allow two trials recording the better score. The score is recorded to the nearest inch or centimeter. Stretches above 12"(30 cm.) are discouraged; therefore, distances above 12" (30 cm.) should be recorded as 12" (30 cm.).

Test Modifications:

- In the case of persons with mental retardation, it is permissible to hold the legs of the subject in place on the mat during the test.
- Individuals with disabilities should be given sufficient time to practice the test and become thoroughly familiar with the testing procedure.
- When explaining the test item to subjects who are blind, it may be helpful to have them feel an individual demonstrating the skill.

Suggestions for Test Administration:

- Do not allow participants to do ballistic (bouncing) movements.
- Do not encourage participants to raise higher than 12". Excessive arching of the back may cause compression of the discs.
- Since motivation is an important factor, positive reinforcement should be given continually throughout the test.
- It is important that attention is given to performance technique during this test.

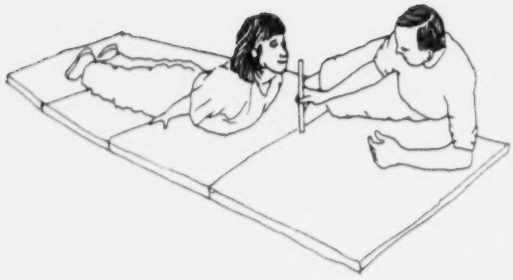

Figure 5.23. The Trunk Lift Test

Wheelchair Ramp Test

***Test Description*:** Participants in wheelchairs attempt to push their chairs using their arms up a standard wheelchair ramp. The test item is designed to measure upper body strength and endurance.

***Equipment*:** A standard wheelchair ramp is required. A standard ramp is one that is in accord with the American National Standards Institute (ANSI) guidelines which specify that ramps should be at least 36 inches wide and constructed with 12 inches of run for every inch of rise (e.g., if the ramp has an elevation of 14 inches, the length of the ramp will be 14 feet). For this test the ramp must be at least 8 feet long (i.e., 8 feet of run), but need not be longer than 30 feet. On longer ramps, testers should place lines 8 feet, 15 feet, and 30 feet from the start of the incline. (Ramps longer than 30 feet generally will have a level platform at the 30 foot mark.) It is anticipated that testers will use ramps which already exist in their schools (or other buildings) to conduct this test although a ramp with 8 feet of run is not difficult to construct (See Appendix C).

Scoring and Trials: Participants start with their lead wheels off the ramp and attempt to get their rear wheels beyond the lines on the ramp. Going beyond the 8 foot line satisfies one specific standard for this test. A second specific standard is obtained when the youngster either goes beyond the 15 foot line or makes it to the top of a longer ramp the youngster frequently encounters (e.g., a 20-foot ramp that leads to the entrance of the school). Testers, therefore, can set a specific standard between 15 and 30 feet based on the environment a youngster must negotiate. The test is not timed and two trials may be administered, if necessary. The test is scored as pass/fail based upon minimal (8 feet) or preferred $\geq$ 15 feet) standards.

Test Modifications:

- The test can be conducted on a ramp that does not meet the ANSI incline standards (provided it is otherwise safe), but the tester will have to develop individualized standards.

Suggestions for Test Administration:

- Safety precautions should be taken to insure that the wheelchair cannot roll off the edge of the ramp.
- Participants should be spotted from behind in case the wheelchair begins to roll back down the incline.

Flexibility/Range of Motion

Apley Test (Modified)

Test Description: The participant attempts to reach back and touch with one hand the superior medial angle of the opposite scapula (See Figures 5.24 and 5.25). The test is designed to measure upper body flexibility.

Equipment: None required.

Scoring and Trials: One trial is given for each arm. If the participant can successfully touch the superior medial angle of the opposite scapula and hold that position for 1-2 seconds, a score of "3" is awarded for that arm. If the participant cannot achieve a score of "3", the conditions of the test are altered so that the participant attempts to touch the top of the head. A successful attempt obtains a score of "2'. If the participant cannot achieve a score of "2", the conditions of the test are altered again so that the participant attempts to touch the mouth. Participants are awarded a "1" if the hand-to-mouth criterion is met. If the participant is unable to touch the mouth, a score of "0" is given for that arm. The scoring scheme is summarized below:

3 - touch the superior medial angle of opposite scapula
2 - touch the top of the head
1 - touch the mouth
0 - unable to touch the mouth

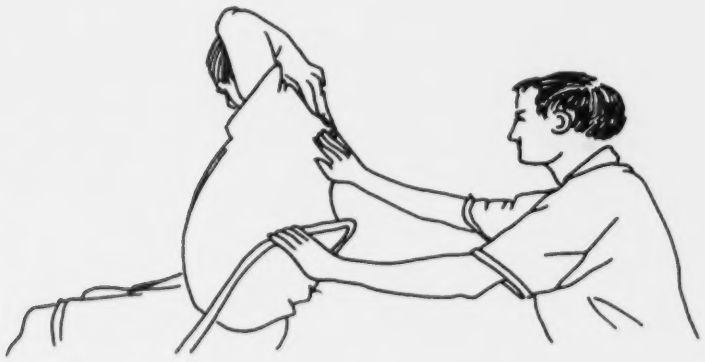

Figure 5.24. Administering the Modified Apley Test

(a)

(b)

(c)

Figure 5.25 Scoring the Modified Apley Test
(a) Mouth
(b) Top of head
(c) Scapula

***Test Modifications*: None.**

Suggestions for Test Administration:

- Testers may place their fingertips along the superior medial angle of the scapula (or on the top of the head) to provide a "target" for the participant as well as to provide a more objective criterion for scoring (i.e., if the participant can touch the tester's fingertips a passing score is awarded).
- Participants should be given ample opportunity to practice this test. Physical assistance may be provided during practice, but not during the conduct of the test.
- Participants should be given encouragement and positive reinforcement.
- Testers must require youngsters to hold the test position briefly (1-2 seconds) for a score of 3 to be awarded. Ballistic or reflexive touches are not acceptable.
- Sufficient warm-up including shoulder stretching activities should proceed testing.

Back Saver Sit and Reach

Test Description: The object of this test is to reach across a sit and reach box while keeping one leg straight. The test item is designed to measure flexibility of the hamstring muscles. The participant begins the test by removing shoes and sits down at the test apparatus (very thin footwear is permitted). One leg is fully extended with the foot flat against the end of the testing instrument. The other knee is bent with the sole of the foot flat on the floor and 2-3 inches to the side of the straight knee. The arms are extended forward over the measuring scale with the hands placed one on top of the other. With palms down, the participant reaches directly forward with both hands along the scale four times and holds the position of the fourth reach for at least one second (See Figure 5.26). After measuring one side, the participant switches the position of the legs and reaches again. The participant may allow the bent knee to move to the side if necessary as the body moves by it.

Equipment: This measurement is best taken using a flexibility testing apparatus approximately 12 inches high and 12 inches wide. A measuring scale is placed on top of the apparatus with the 9 inch (or 23 cm.) mark even with the near edge of the box (See Appendix C). The "zero" end of the ruler is nearest the participant (See Figures 5.26 and 5.27). The grid on the box should range from 0 to at least 16 inches (40 cm).

Scoring and Trials: One trial for each leg is given for this test. The tester records the number of inches or cm. reached on each side to the last whole cm. or inch reached. Reaches beyond the criterion-referenced standards designated for this test item are not recommended.

Test Modifications:

- Subjects with mental retardation should be given sufficient time for practicing the test to become completely familiar with the testing procedure. They should not be encouraged to exceed the recommended criterion-referenced standards for this test item.
- Verbal description of the testing environment and procedure is necessary for blind subjects. They may be given physical assistance as they practice the test and become familiar with the procedure. Physical assistance may not be given during the test, itself, however.
- If a flexibility testing apparatus is not available, a ruler extended over a bench turned on its side may be used to obtain measurements. This may be less accurate than when the recommended testing apparatus is used.

Suggestions for Test Administration:

- The knee of the extended leg must remain straight. The tester should place one hand on the straightened leg to assist proper positioning.
- Hands should reach forward evenly and the shoulders should be "square" to the test apparatus.
- Hips must remain square to the box. Do not allow participants to turn their hip away from the box as they reach.

- Require participants to stretch the hamstrings and lower back as a warm-up prior to testing.
- Since motivation is an important factor, the participant should receive continual encouragement and positive reinforcement during the testing process.
- Emphasize a gradual reach forward. Bobbing or jerking movements forward should not be permitted.

(a)

(b)

Figure 5.26. Back Saver Sit and Reach Test
(a) Right view
(b) Left view

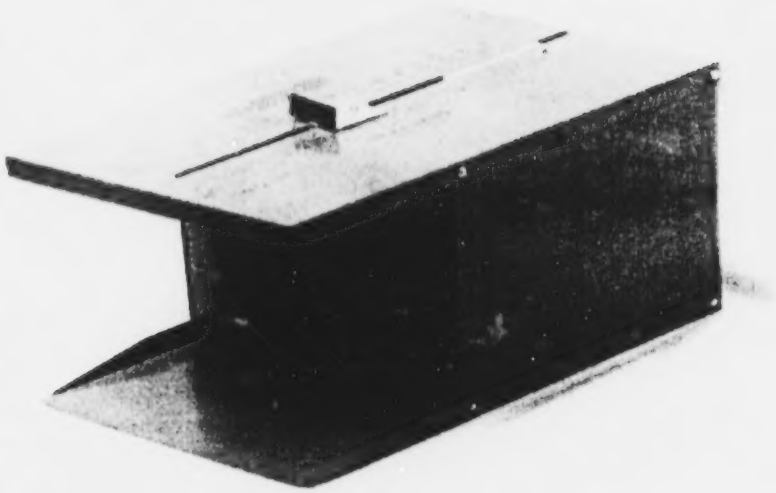

Figure 5.27. A Commercially-built Flex-Tester

Shoulder Stretch

Test Description: This test item is used to determine if a participant is able to touch the fingertips together behind the back by reaching over the shoulder and down the back with one arm and across the back with the other arm. This test item is designed to measure upper body flexibility (See Figure 5.28). The measure is designated as right or left on the basis of the arm reaching over the shoulder. Thus, when the right arm stretches over the right shoulder, it is a right arm stretch.

Figure 5.28. Shoulder Stretch - Right Shoulder

Equipment: No equipment is necessary to complete this test item.

Scoring and Trials: One test trial is permitted. The test is scored on a pass/fail basis. The participant passes if the fingers touch and fails if the fingers do not touch.

Test Modifications:

- Physical assistance, as well as verbal direction, may be given to subjects with disabilities as they practice the test. Physical assistance may not be given during the test, itself, however.

Suggestions for Test Administration:

- The participants should be given ample opportunity to practice this testing procedure.
- Upper body stretching including approximations of the test itself is recommended as a warm-up.

Thomas Test (Modified)

Test Description: The test is designed to assess the length of the participant's hip flexor muscles. The test is conducted on a sturdy table (See Figures 5.29 and 5.30). The tester places a thin strip of masking tape on the table 11" from the narrow edge. The participant lies in a supine position on the table in such a way as to place the head of the femur level with the strip of tape. (The tester should attempt to insure that the hip joint is 11" from the edge of the table.) The lower legs can be relaxed and should hang off the narrow edge of the table. To test the right hip, the participant should lift the left knee toward the chest. The participant should use the hands to pull the knee toward the chest until the participant's back is flat against the table. At that point, the tester should observe the position of the participant's right thigh. Participants will receive the maximum score if they can keep the thigh in contact with the table surface while the back is flat. To test the left hip, the right knee should be pulled toward the chest and the left thigh is evaluated; all other procedures are the same.

Equipment: A sturdy table with a tape mark 11" from one of the narrow (i.e., "short") sides of the table is required. It is recommended that the tester also have available a 3 x 5" file card and a 4 x 6" file card (or equivalents) to help with the scoring. (A tape measure or a ruler could also be used.)

Scoring and Trials: One trial for each leg is appropriate for most participants. The test is scored on a 0 to 3 point scale as follows:

3 - the tested leg remains in contact with the surface of the table when the opposite knee is pulled toward the chest and that back is flat (See Figure 5.29).

2 - the tested leg does not remain in contact with the surface of the table, but the distance from the participant's leg to the edge of the table is less than 3" (e.g., if the leg is elevated but the tester cannot slide the 3" side of the 3 x 5" file card under the participant's leg at the edge of the table a score of 2 is appropriate).

1 - the tested leg lifts more that 3", but less than 6", from the edge of the table (e.g., if the 3" side of the 3 x 5" file card slides under the participants leg at the edge of the table, but the 6" side of the 4 x 6" card does not, a score of 1 is appropriate) (See Figure 5.30).

0 - the tested leg lifts more than 6" from the edge of the table (e.g., if the 6" side of the 4 x 6" file card slides under the participant's leg at the edge of the table a score of 0 is appropriate) (See Figure 5.30).

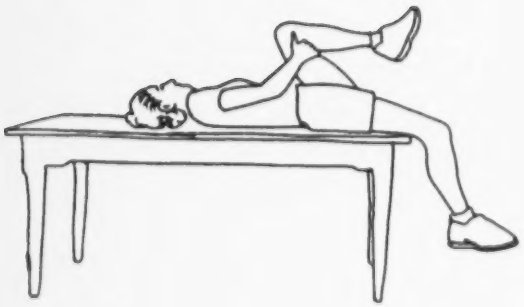

Figure 5.29. The Modified Thomas Test - Score of 3

(a)

(b)

Figure 5.30. Card Assistance on the Modified Thomas Test
(a) Score of 0
(b) Score of 1

Test Modifications:

- If necessary, a tester or spotter can gently assist the participant in pulling the opposite knee toward the chest. In any event, it is important that the back is flat on the table prior to scoring the test.
- If, after multiple attempts, a youngster is unable to flatten the lower back, the tester should score the test as indicated above and note on the score sheet that the back was not flat. Scores obtained in this manner should not be compared to the general or specific standards recommended in this manual. Instead, these scores can be used to monitor future progress and testers are encouraged to develop individualized standards for the youngster.
- If the lower leg interferes with the file card while scoring the test, it may be that the youngster is too short for the 11" line. Alternately, the tester could place the line 7 ½" from the edge of the table. In this case, a 2" file card would be substituted for the 3" card and a 4 5/16" file card would be substituted for the 6" card. Otherwise the scoring and interpretations are the same.

Suggestions for Test Administration:

- Participant's should stretch or otherwise "warm-up" the hip muscles prior to testing.
- If testers prefer to use a tape measure or ruler to evaluate the extent of elevation of the tested leg, the measurement should be taken from the edge of the table to the posterior aspect of the upper leg.
- Testers can help determine flatness of the lower back by attempting to move their hand through the hollow part of the lower back. Ordinarily the hand is unable to move through the lower back area if the back is flat.
- For youngsters who score a 3 it is recommended that testers note any knee extension or thigh abduction that occurs during the test. If the knee extends (rectus femoris) or the thigh abducts (tensor fasciae latae), the indication is that some of the hip flexors (iliopsoas and sartorius) are of normal length, but that others may be shortened.
- Testers must insure that the head of the femur is lined-up with the tape mark on the table before scoring the test. The position of the head of the femur may change when the knee is brought to the chest. It is recommended that testers mark the location of the head of the femur with a small piece of masking tape and make sure that the mark is directly above the line on the table before scoring. It may be necessary to position the mark off the line initially providing it moves to a position above the line when the knee is brought toward the chest.

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Target Stretch Test

Test Description: The Target Stretch Test (TST) is a screening instrument used to estimate movement extent in a joint. It includes a series of tests administered in conjunction with the sketches on the following pages (See Figure 5.33). For each individual test, testers ask participants to achieve their maximum movement extent, or limit, for a given joint action and subjectively evaluate that limit against criteria provided in the sketches. Testers should demonstrate (and/or clearly describe) the optimal (i.e., complete) movement extent for each joint being tested. Descriptions of individual items are as follows:

Wrist Extension: The recommended test position is to have the participant in either a standing or seated position with the elbow flexed to 90° and the forearm pronated (palm down). Participants extend the wrist as far as possible and testers read the longitudinal axis (i.e., the middle) of the lateral aspect of the hand (not the fingers).

Elbow Extension: The recommended test position is to have the participant in either an erect standing or seated position with the upper arm at the side. Preferably the forearm should be supinated (palm facing forward). Participants extend the elbow as far as possible and testers read the longitudinal axis of the forearm from elbow to wrist (not the hand or fingers).

Shoulder Extension: The recommended test position is to have the participant in either an erect standing or seated position with the arm at the side (palm facing the side). Participants extend the shoulder as far as possible and testers read the longitudinal axis of the upper arm from shoulder to elbow while assuring that the participant's trunk remains erect.

Shoulder Abduction: The recommended test position is to have the participant in either an erect standing or seated position with the arm at the side. Participants abduct the shoulder as far as possible and testers read the longitudinal axis of the upper arm from the shoulder to the elbow while assuring that the participant's trunk remains erect. (When the shoulder is fully abducted the palm should face inward, i.e., toward the midline of the body.)

Shoulder External Rotation: The recommended test position is to have the participant seated so that the tester can evaluate the movement by observing from above the participant's shoulder. The recommended position also requires 90° of elbow flexion and contact between the upper arm and the lateral aspect of the trunk (i.e., adduction). Participants externally rotate the shoulder as far as possible by moving the wrist away from the trunk while maintaining an adducted upper arm and 90° of elbow flexion. The tester reads the longitudinal axis of the forearm from elbow to wrist (See Figure 5.31).

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Figure 5.31. Right Shoulder External Rotation Test Position

Forearm Supination: The recommended test position is to have the participant face the tester in either a standing or seated position with elbow flexed while holding a pencil (or similar object) in a closed fist. (The long end of the pencil should protrude from the thumb side of the fist.) The participant supinates the forearm (palm up) as far as possible and the tester reads the long end of the pencil.

Forearm Pronation: The recommended test position is to have the participant face the tester in either a standing or seated position with elbow flexed while holding a pencil (or similar object) in a closed fist. (The long end of the pencil should protrude from the thumb side of the fist.) The participant pronates the forearm (palm down) as far as possible and the tester reads the long end of the pencil.

Knee Extension: The recommended test position is to have the participant in a side-lying position on a rug or mat. (The bottom leg may be bent for stability while the top knee is being evaluated.) The tester views the extended leg from above while standing behind the knee being evaluated. The tester reads the longitudinal axis of the lower leg from knee to ankle.

Equipment: No equipment is necessary for participants who are able to achieve the recommended test positions for each item. Testers will simply compare the participant's movement to the criteria provided in the sketches. In cases where participants cannot achieve the recommended test position, the test can still be administered, but evaluation of performance may be enhanced by using a modified goniometer. These procedures are discussed under "Test Modifications."

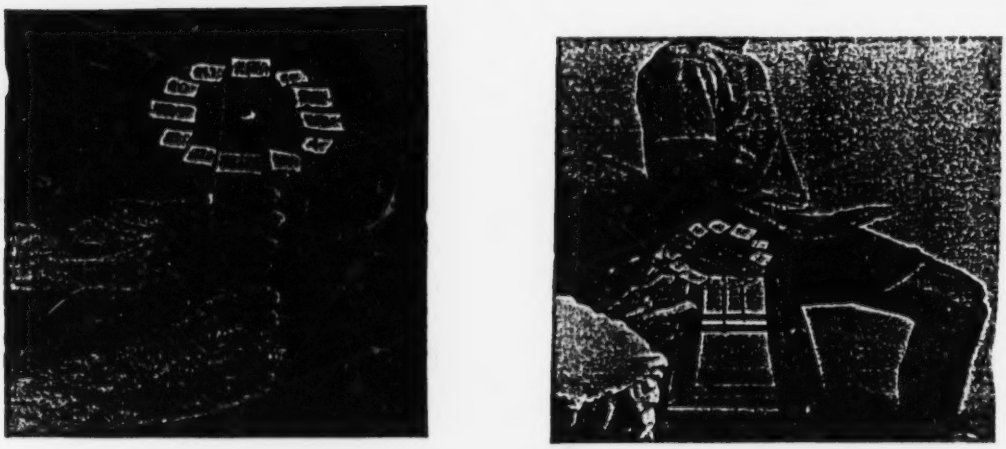
Scoring and Trials: Participants must be able to hold their final position for at least 1-2 seconds. Using a TST worksheet (Figure 5.33), testers initially record the time on the clock to the nearest ½ hour (e.g., 2:30, 8:00, etc.) and then convert the time to a test score (0-2) as given by the sketches. For example, a right wrist extension time of 1:00 receives a score of 2 and times between 1:30 and 2:00 receive a score of 1. Any time "below" 2:00 receives a score of 0. Noting time on the clock may allow the tester to document changes in performance even if the test score does not change. The relationship between test scores and goniometry values is given in Table 5.3.

Table 5.3
Goniometry Values Associated with TST Scores

	Normal[1]	2	1
Wrist Extension	70^0	60^0	30^0
Elbow Extension	0^0	0^0	-15^0
Shoulder Extension	60^0	60^0	30^0
Shoulder Abduction	170^0	165^0	120^0
Shoulder External Rotation	90^0	75^0	30^0
Supination/Pronation	90^0	90^0	45^0
Knee Extension	0^0	0^0	-15^0

[1] Normal, or typical, range of motion values found in the literature vary somewhat from authority to authority. These values come from Cole (1990). In some cases, values for test scores of 2 differ from Cole's values due to the recommendation that testers estimate time on the clock to the nearest half-hour. In the case of shoulder external rotation, some of the difference between a normal score and a score of 2 is due to differences in test procedures.

Test Modifications: If a participant cannot achieve the recommended test position depicted in the sketch, the joint action can still be assessed, but the clock must be rotated to maintain the integrity of the scoring system. For instance, in right wrist extension the recommended test position includes maintaining elbow flexion of 90°. A participant, however, could be tested with a completely extended elbow if the clock was rotated 90° so that the 9 was at the top of the clock (where the 12 usually is). Conceptually, this may become difficult for the tester, so it is recommended that testers modify a plastic (see-through) goniometer to help rotate the clock into the proper position. The circular dial of the goniometer can be converted into a clock face by placing the numerals 1-12 on strips of tape at 30° intervals. Once the goniometer is modified, it can be used to "rotate the clock" and estimate movement extent from a variety of test positions. When using the modified goniometer, it is recommended that testers stand, crouch, kneel, etc. approximately 5-10 feet from the participant. The tester reads the time on the clock by holding the goniometer at arm's length and viewing the limb in question through the face of the goniometer.



(a) (b)

Figure 5.32. Modified Goniometer
(a) Close-up view
(b) Measuring wrist extension

Suggestions for Test Administration:

- Testers should help participants to maximize their movement extent. Changes in body position may influence a youngster's performance. Youngsters who have tonic neck reflexes, for instance, may enhance their performance by either flexing, extending, or turning the head while being tested. Testers should help youngsters find the position that maximizes the movement extent in a joint as long as the position is noted on the worksheet and as long as the integrity of the scoring system is maintained (i.e., the clock may need to be rotated).
- When evaluating a number of participants, testers may find that they can accelerate the testing process by recording the estimated time on the clock (e.g., 1:30) during testing and converting the time to a score (i.e., 0-2 points) some time after the testing session.
- Participants should warm-up the joints being assessed prior to testing.
- Testers may find it helpful to tape photocopies of the sketches (enlargements work best) to a nearby wall to eliminate flipping back and forth between pages in the manual or worksheet.
- When establishing the theoretical clock by which to assess the extent of movement, it is recommended that testers first imagine "cross hairs" through the joint. The vertical line establishes 12:00 and 6:00 while the horizontal line establishes 3:00 and 9:00. Next, imagine a line that divides the quadrant containing the limb in question in half. This is 1:30 for the upper right quadrant, 4:30 for the lower right quadrant, and so forth. Finally, the tester estimates time on the clock to the nearest half-hour based on the relationship of the limb to the relevant side of the cross-hairs and the line dividing the quadrant.

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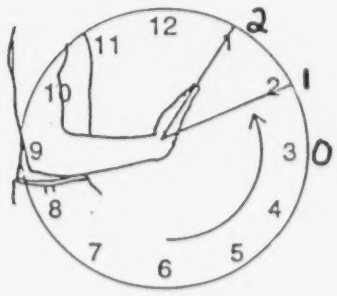
Figure 5.33
Target Stretch Test (TST)
Worksheet

Testers who administer the TST might find this worksheet helpful and are free to photocopy the form as often as necessary. The sketches demonstrate the recommended test positions, the theoretical clock, and the criteria for minimal and preferred standards. Spaces are available to the right of each sketch to record both time on the clock to the nearest half-hour and corresponding test score (0-2). After using the worksheet, testers can transfer test scores to the BPFT Test form. Spaces are provided to allow for multiple administrations of the test. Below each sketch is room to note any variation in test position which might be necessary when youngsters cannot attain the recommended test position. There is also room to note any relevant observations the tester may make.

Name: _____ **Tester:** _____

Date(s): _____ _____ _____

(a) Wrist Extension-Right

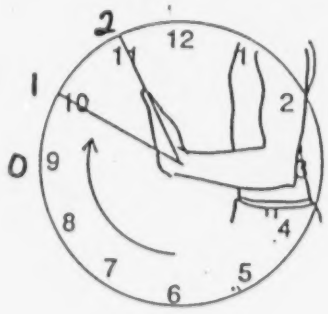


Time	Score
____	____
____	____
____	____
____	____

Position: _____

Comments: _____

(b) Wrist Extension-Left

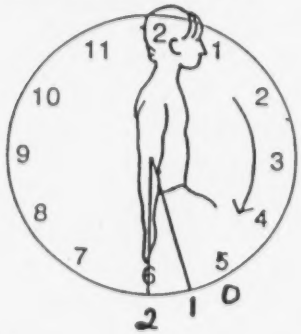


Time	Score
____	____
____	____
____	____
____	____

Position: _____

Comments: _____

(c) Elbow Extension-Right

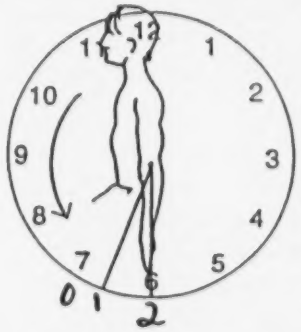


Time	Score
____	____
____	____
____	____
____	____

Position: _____

Comments: _____

(d) Elbow Extension-Left

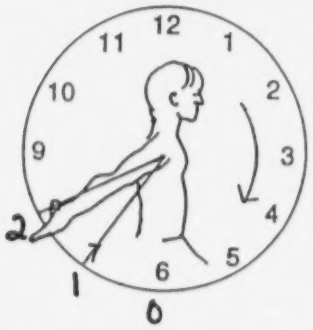


Time	Score
____	____
____	____
____	____
____	____

Position: _____

Comments: _____

(e) Shoulder Extension-Right

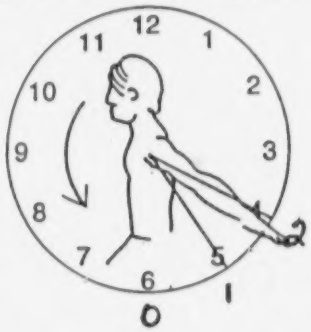


Time	Score
____	____
____	____
____	____
____	____

Position: _____

Comments: _____

(f) Shoulder Extension-Left

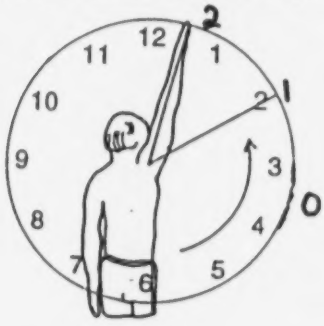


Time	Score
____	____
____	____
____	____
____	____

Position: _____

Comments: _____

(g) Shoulder Abduction-Right



Test	Score
____	____
____	____
____	____
____	____

Position: _____

Comments: _____

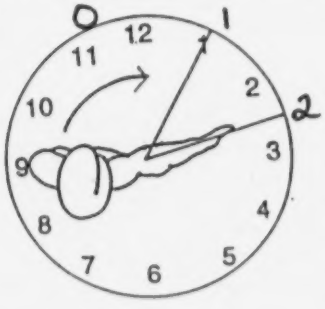
(h) Shoulder Abduction-Left

Test	Score
____	____
____	____
____	____
____	____

Position: _____

Comments: _____

(i) Shoulder External Rotation-Right

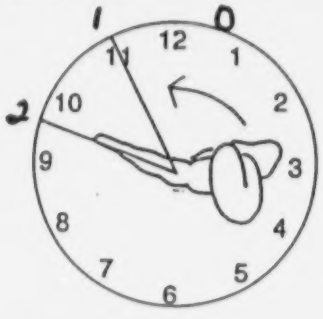


Test	Score
____	____
____	____
____	____
____	____

Position: _____

Comments: _____

(j) Shoulder External Rotation-Left

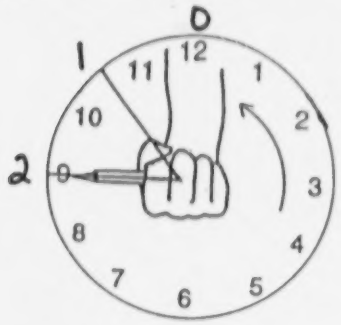


Test	Score
____	____
____	____
____	____
____	____

Position: _____

Comments: _____

(k) Forearm Supination-Right

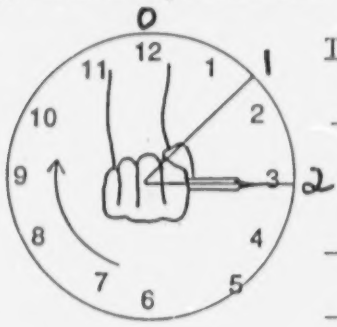


Test	Score
____	____
____	____
____	____
____	____

Position: _____

Comments: _____

(l) Forearm Supination-Left

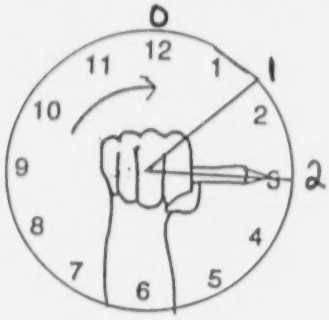


Test	Score
____	____
____	____
____	____
____	____

Position: _____

Comments: _____

(m) Forearm Pronation-Right

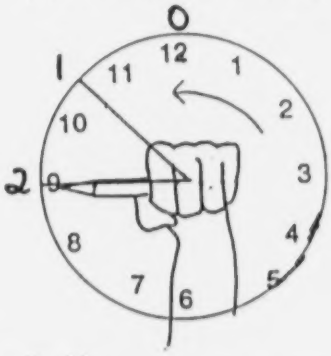


Test	Score
____	____
____	____
____	____
____	____

Position: _____

Comments: _____

(n) Forearm Pronation-Left

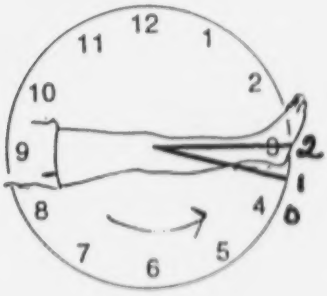


Test	Score
____	____
____	____
____	____
____	____

Position: _____

Comments: _____

(o) Knee Extension-Right

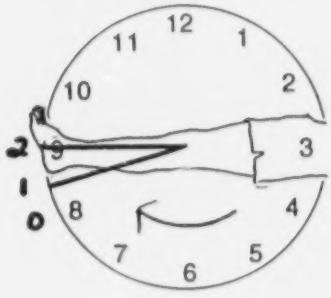


Test	Score
____	____
____	____
____	____
____	____

Position: _____

Comments: _____

(p) Knee Extension-Left



Test	Score
____	____
____	____
____	____
____	____

Position: _____

Comments: _____

Chapter VI

Testing Youngsters with Severe Disabilities

The Brockport Physical Fitness Test is a health-related criterion-referenced physical fitness test appropriate for most youngsters with disabilities and unique needs related to physical fitness. However, it may be inappropriate for youngsters with severe disabilities for a variety of reasons. Often these reasons include inability of this population to perform field-based performance test items as described in procedures presented in this manual. Levels of physical fitness, motivation, understanding, and basic motor ability required to perform test items may be lacking. In regard to this situation, two alternate orientations for assessment are offered in the following pages. These may yield information regarding physical activity rather than physical fitness and may most appropriately represent individualized rather than health-related criterion-referenced standards. However, results may be helpful in designing programs leading to acceptable levels of physical fitness/physical activity. The two orientations relate to task analysis and measurement of physical activity.

Task Analysis

A task analysis breaks movements, skills, or activities into tasks and/or subtasks. Tasks are associated with outcomes which can be targeted, learned, and measured. They represent points of focus in the performance of an activity. Ideally, they take a youngster from present level of performance through activities leading to a terminal objective. There are a variety of ways of designing a task analysis.

The use of task analysis for the development and assessment of physical fitness for persons with severe disabilities is not new. Jansma, Decker, Ersing, McCubbin, and Combs (1988) presented the Project Transition Assessment System and contrasted it with the Data Based Gymnasium, the I CAN Adaptative Model and Project MOBILITEE assessment systems. All of these programs use task analysis. These authors also have summarized factors that require attention if a satisfactory assessment of those with severe disabilities is to result. In brief, these include the need for task analytic procedures, more frequent data collection, unobtrusive informal observational measures, the use of verbal and nonverbal cues, age-appropriateness, maintenance and generalization of status, appropriate prompting levels, and systematic rapport. It is recommended that those interested in physical fitness testing for persons with severe disabilities consult the programs identified above. Also, worthwhile to consider is the assessment process associated with Project Transition (Jansma et al, 1988) in developing a task analytic assessment system.

In many instances throughout the test selection guides presented in this manual, the development of a task analysis is recommended for the purpose of leading youngsters toward acceptable levels of health-related criterion-referenced levels of physical fitness. Table 6.1 presents one example of a task analysis using a test item associated with the Brockport Physical Fitness Test. It is consistent with the process associated with Project Transition developed by Jansma, et al (1988) in connection with Project Transition.

Measures of Physical Activity

Before recommending procedures regarding measurement of physical activity, it is important to remember that physical activity and physical fitness are separate but related concepts. When measuring physical fitness, a characteristic or characteristics reflecting a set of attributes that people possess or achieve are measured (Casperson, 1985; Freedson & Melanson, 1996). The Brockport Physical Fitness Test is used to measure physical fitness. When measuring physical activity, a behavior reflecting energy expenditure is typically used. Examples of physical activity measures which may be used include caloric expenditure; frequency intensity, duration of activity; and heart rate responses to exercise (Freedson & Melanson, 1996). These measures may be attained or estimated using a variety of strategies including direct observation, self-report measures, mechanical and electronic monitoring, and physiologic measures. These strategies are presented and discussed in a variety of sources (Freedson and Melanson, 1996; Freedson, 1991). Pedometers, the Caltrac accelerometer, motion sensors and heart rate monitors appear to hold promise of obtaining the most accurate measures of physical activity for individuals with severe disabilities. Teachers are encouraged to monitor the frequency, intensity, and duration of the physical activity of their more severely involved youngsters and develop strategies for increasing those levels. Increases in physical activity often will lead to increases in physical fitness even if fitness cannot be validly assessed.

Since physical fitness and physical activity may have independent effects on health status (Blair, Kohl, Paffenbarger, Clarke, Cooper, & Gibbons, 1990), different standards may also be needed and recommended for each. In regard to physical activity, the United States Center for Disease Prevention and Control (CDC) and the American College of Sports Medicine (ACSM) recommended 30 minutes or more of moderate-intensity physical activity on most, preferably all days of the week and point out that additional health benefits can be attained through greater amounts of physical activity (Pate, et al, 1995; President's Council on Physical Fitness and Sport, 1996). Since this manual focuses on physical fitness, a further discussion of standards relating to physical activity and health benefits will not be presented here. Suffice it to say that different standards for physical fitness and physical activity are appropriate.

Table 6.1
Task Analysis for an Isometric Push-up

Objective: To execute correctly an isometric push-up for three seconds.

Directions: Circle the minimal level of assistance an individual requires when correctly demonstrating a task. A zero is assumed if an item in a row is not cited. Total each level of assistance column and place the subtotals in the sum of column scores row. Total the column scores and place the score in the individuals total score achieved row in the summary section. Determine percent independence score based on the chart below. Record the amount of time the position is held in the product score row.

Isometric Push-up	IND	PPA	TPA
1. Lie in a face down position	3	2	1
2. Place hands under shoulders	3	2	1
3. Place legs straight, slightly apart, and parallel to the floor	3	2	1
4. Tuck toes under feet	3	2	1
5. Extend arms while body is in a straight line position	3	2	1
6. Hold position for three seconds	3	2	1
Sum of Column Scores:			

Key to Levels of Assistance:

IND=Independent-the individual is able to perform the task without assistance
PPA=Partial Physical Assistance-the individual needs some assistance to perform the task
TPA=Total Physical Assistance-the individual needs assistance to perform the entire task

Summary:

Total Score Achieved:	
Total Score Possible:	18
% Independent Score:	
Product Score:	

Percentage of Independence

6/18=33%	11/18=61%	16/18=88%
7/18=38%	12/18=66%	17/18=94%
8/18=44%	13/18=72%	18/18=100%
9/18=50%	14/18=77%	
10/18=55%	15/18=83%	

Modified from Houston-Wilson, Cathy. Alternate Assessment Procedures. In American Association for Active Lifestyles and Fitness (1995). Physical Best and Individuals with Disabilities: A handbook for inclusion in Fitness Programs. Virginia: Reston. The Author.

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Appendices

Appendix A

Glossary of Terms

This section presents a listing of terms associated with the Brockport Physical Fitness Test and a description of how they are used in relationship to the test.

Aerobic Behavior - a subcomponent of aerobic functioning that relates to the ability to sustain physical activity of a specific intensity for a particular duration.

Aerobic Capacity - a subcomponent of aerobic functioning that relates to the highest rate of oxygen that can be consumed by a person while exercising.

Aerobic Functioning - the component of physical fitness that permits one to sustain large muscle, dynamic, moderate to high intensity activity for prolonged periods of time. Aerobic behavior and aerobic capacity are sub-components of aerobic functioning.

Body Composition - the component of health-related physical fitness that is related to the degree of leanness/fatness of the body.

Body Mass Index (BMI) - an index of the relationship between an individual's height and weight.

$$\text{BMI} = \frac{\text{body weight (kg.)}}{\text{height}^2\text{ (in.)}} \quad \text{or} \quad \frac{704.5 \times \text{body weight (lb.)}}{\text{height}^2\text{ (in.)}}$$

Components of Physical Fitness - categories or constructs that measure separate or unique aspects of fitness. The health-related components of fitness adopted for the Brockport Physical Fitness Test include aerobic functioning, body composition, and musculoskeletal functioning.

Criterion-referenced standard - a target measure of attainment against which a test score is judged. Criterion-referenced health standards used in the Brockport Physical Fitness Test are set in relationship to a level of attainment associated with physiological and/or functional health.

Flexibility - a subcomponent of musculoskeletal functioning that reflects the extent of movement possible in multiple joints while performing a functional task.

Functional Health - an aspect of health related to the physical capability of the individual. Indices of functional health include the ability to perform important tasks independently and the ability to independently sustain the performance of those tasks. Ability to perform activities of daily living (ADLs), to sustain physical activity, and participate in leisure activities are examples of indices of good functional health.

General criterion-referenced standard - a target measure of attainment associated with a general population of youngsters and/or a standard that is not adjusted for the effects of impairment or disability. General standards may be recommended for the general population as well as for youngsters with disabilities.

Health - a human condition with physical, social, and psychological dimensions, each characterized on a continuum with positive and negative poles. Positive health is associated with a capacity to enjoy life and to withstand challenges; it is not merely the absence of disease. Negative health is associated with morbidity and, in the extreme, with premature mortality (Bouchard & Shephard, 1994). In the BPFT, health is conceptualized as having both functional and physiological aspects.

Health-Related Physical Fitness - A state characterized by (a) an ability to perform and sustain daily activities and (b) demonstration of traits or capacities that are associated with a low risk of premature development of diseases and conditions related to movement. It refers to those components of fitness that are affected by habitual physical activity and relate to health status.

Individualized Standard - a desired level of attainment for an individual in an area of health status established in consideration of one's present level of performance and expectation for progress. It may not necessarily reflect a health-related standard.

Minimal standard - the lowest acceptable health-related criterion-referenced level of attainment for the general population. Minimal general standards reflect minimally acceptable levels of health-related physical fitness for the general population.

Muscular Endurance - a subcomponent of musculoskeletal functioning that reflects the ability to repeatedly perform submaximal muscular contractions.

Muscular Strength - a subcomponent of musculoskeletal functioning that reflects the maximal amount of force that is exerted.

Musculoskeletal Functioning - the component of physical fitness that combines muscular strength, muscular endurance, and flexibility/range of motion.

Optional Test Item - an alternative test item considered to be appropriate and acceptable for the measurement of components of physical fitness.

Physical Activity - consists of any bodily movement produced by skeletal muscle resulting in a substantial increase over resting energy expenditure (Bouchard & Shephard, 1994).

Physical Fitness - a set of attributes that people have or achieve that relate to the ability to perform physical activity (Caspersen, Powell, & Christenson, 1985).

Physiological Health - an aspect of health related to organic well-being. Indices of physiological health include traits or capacities that are associated with well-being, absence of a disease or condition, or low risk of developing a disease or a condition.

Preferred standard - a good health-related criterion-referenced level of attainment for the general population. A single general standard for a particular test item is considered equivalent to a preferred standard. Preferred general standards reflect good levels of health-related physical fitness for the general population.

Profile - the direction or broad goal for a health-related physical fitness program.

Range of Motion - a subcomponent of musculoskeletal functioning that refers to the extent of movement in a single joint.

Recommended Test Item - a test item considered to be appropriate and most acceptable for the measurement of physical fitness when factors for selecting test items are equal.

Specific criterion-referenced standard - a target measure of attainment associated with a defined category of persons and/or a standard that is adjusted for the effects of impairment or disability. Specific standards are only provided for selected test items for specific target populations. The reflect minimal acceptable levels of health-related physical fitness adjusted for the effects of impairment.

Body Mass Index Chart

Height (in)	49	51	53	55	57	59	61	63	65	67	69	71	73	75	77	79	81	83
Weight (lb)																		
66	19	18	16	15	14	13	12	12	11	10	10	9	9	8	8	8	7	7
70	20	19	18	16	15	14	13	13	12	11	10	10	9	9	8	8	8	7
75	22	20	19	17	16	15	14	13	12	12	11	10	10	9	9	9	8	8
79	23	21	20	18	17	16	15	14	13	12	12	11	11	10	9	9	9	8
84	24	22	21	19	18	17	16	15	14	13	12	12	11	11	10	10	9	9
88	26	24	22	20	19	18	17	16	15	14	13	12	12	11	11	10	10	9
92	27	25	23	21	20	19	17	16	15	15	14	13	12	12	11	11	10	10
97	28	26	24	22	21	20	18	17	16	15	14	14	13	12	12	11	10	10
101	29	27	25	23	22	20	19	18	17	16	15	14	13	13	12	12	11	10
106	31	28	26	24	23	21	20	19	18	17	16	15	14	13	13	12	11	11
110	32	30	27	26	24	22	21	20	18	17	16	15	15	14	13	13	11	11
114	33	31	29	27	25	23	22	20	19	18	17	16	15	14	14	13	12	12
119	35	32	30	28	26	24	22	21	20	19	18	17	16	15	14	14	13	12
123	36	33	31	29	27	25	23	22	21	19	18	17	16	16	15	14	13	13
128	37	34	32	30	28	26	24	23	21	20	19	18	17	16	15	15	14	13
132	38	36	33	31	29	27	25	23	22	21	20	19	18	17	16	15	14	14
136	40	37	34	32	29	28	26	24	23	21	20	19	18	17	16	16	15	14
141	41	38	35	33	30	28	27	25	24	22	21	20	19	18	17	16	15	15
145	42	39	36	34	31	29	27	26	24	23	22	20	19	18	17	17	16	15
150	44	40	37	35	32	30	28	27	25	24	22	21	20	19	18	17	16	15
154	45	41	38	36	33	31	29	27	26	24	23	22	20	19	18	18	17	16
158	46	43	40	37	34	32	30	28	26	25	24	22	21	20	19	18	17	16
163	47	44	41	38	35	33	31	29	27	26	24	23	22	20	19	19	18	17
167	49	45	42	39	36	34	32	30	28	26	25	23	22	21	20	19	18	17
172	50	46	43	40	37	35	32	30	29	27	25	24	23	22	21	20	19	18
176	51	47	44	41	38	36	33	31	29	28	26	25	23	22	21	20	19	18
180	52	49	45	42	39	36	34	32	30	28	27	25	24	23	22	21	20	19
185	54	50	46	43	40	37	35	33	31	29	27	26	25	23	22	21	20	19
189	55	51	47	44	41	38	36	34	32	30	28	27	25	24	23	22	20	20
194	56	52	48	45	42	39	37	34	32	30	29	27	26	24	23	22	21	20
198	58	53	49	46	43	40	37	35	33	31	29	28	26	25	24	23	21	20
202	59	54	50	47	44	41	38	36	34	32	30	28	27	25	24	23	22	21
207	60	56	52	48	45	42	39	37	35	33	31	29	27	26	25	24	22	21
211	61	57	53	49	46	43	40	38	35	33	31	30	28	27	25	24	23	22
216	63	58	54	50	47	44	41	38	36	34	32	30	29	27	26	25	23	22
220	64	59	55	51	48	44	42	39	37	35	33	31	29	28	26	25	24	23
224	65	60	56	52	49	45	42	40	37	35	33	31	30	28	27	26	24	23
229	67	62	57	53	49	46	43	41	38	36	34	32	30	29	27	26	25	24
233	68	63	58	54	50	47	44	41	39	37	35	33	31	29	28	27	25	24
238	69	64	59	55	51	48	45	42	40	37	35	33	32	30	28	27	26	24
242	70	65	60	56	52	49	46	43	40	38	36	34	32	30	29	28	26	25
246	72	66	61	57	53	50	47	44	41	39	37	35	33	31	29	28	27	25
251	73	67	63	58	54	51	47	45	42	39	37	35	33	32	30	29	27	26
255	74	69	64	59	55	52	48	45	43	40	38	36	34	32	31	29	28	26
260	76	70	65	60	56	52	49	46	43	41	39	36	34	33	31	30	28	27
264	77	71	66	61	57	53	50	47	44	42	39	37	35	33	32	30	29	27
268	78	72	67	62	58	54	51	48	45	42	40	38	36	34	32	31	29	28
273	79	73	68	63	59	55	52	48	46	43	40	38	36	34	33	31	30	28
277	81	75	69	64	60	56	52	49	46	44	41	39	37	35	33	32	30	29
282	82	76	70	65	61	57	53	50	47	44	42	40	37	35	34	32	30	29
286	83	77	71	66	62	58	54	51	48	45	42	40	38	36	34	33	31	29
290	84	78	72	67	63	59	55	52	48	46	43	41	39	37	35	33	31	30
295	86	79	74	68	64	60	56	52	49	46	44	41	39	37	35	34	32	30
299	87	80	75	69	65	60	57	53	50	47	44	42	40	38	36	34	32	31
304	88	82	76	70	66	61	57	54	51	48	45	43	40	38	36	35	33	31
308	90	83	77	71	67	62	58	55	51	48	46	43	41	39	37	35	33	32
312	91	84	78	72	68	63	59	55	52	49	46	44	41	39	37	36	34	32

*This chart was developed on the basis of information published by the Panel on Energy, Obesity, and Body Weight Standards (1987). Energy, Obesity, and Body Weight Standards. American Journal of Clinical Nutrition, 45, p. 1035.

Appendix C

Purchasing and Constructing Unique Testing Supplies

Test Item	Supply Item	Resource Address	Approximate Cost	Phone
PACER Test (20m & 16m).	PACER music tape	Cooper Institute for Aerobics Research 12330 Preston Road Dallas, TX 75230	$ 15.00	1-800-635-7050
Target Aerobic Movement Test (TAMT)	Electronic Heart Rate Monitor - Many types are available	Polar CIC, Inc. ~~99 Seaview Blvd.~~ 370 Crossways Park Drive ~~Port Washington, NY 11050~~ Woodbury, NY 11797-2053	$159.00 for Polar PACER	1-800-227-1314 516-364-0400
Skinfold Test	Lange Skinfold Caliper	Beta Technology, Inc. 151 Harvey West Boulevard Santa Cruz, CA 95060	$196.00	1-408-426-5890
Back Saver Sit and Reach	Sit and Reach Flex-Tester	Things from Bell PO Box 135 East Troy, WI 53120	$ 98.90	1-800-543-1457
Grip Strength	JAMAR Grip Dynamometer	Sammons Preston PO Box 5071 Bolingbrook, IL 60440	$189.95	1-800-323-5547
Seated Push-up	Push-up Blocks	Sammons Preston PO Box 5071 Bolingbrook, IL 60440	$ 98.00	1-800-323-5547

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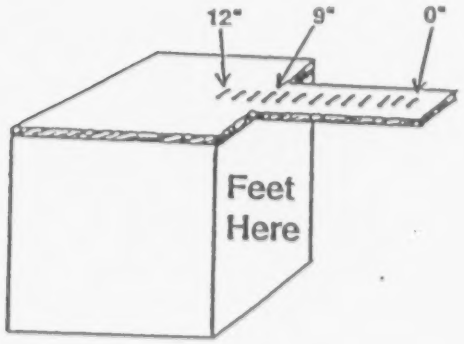
Equipment for Back Saver Sit and Reach

1. Using any sturdy wood or comparable material (3/4 inch plywood seems to work well) cut the following pieces:
   2 pieces - 12 in. x 12 in.
   2 pieces - 12 in. x 10 1/2 in.
   1 piece - 12 in. x 22 in.

2. Cut pieces that are 10 in. x 4 in. from each side of one end of the 12 in. x 22 in. piece to make the top of the box (see diagram). Beginning at the small end make marks on the piece every inch up to 12 inches.

3. Construct a box using nails or screws or wood glue from the remaining four pieces. Attach the top of the box. It is curcial that the 9 inch mark be exactly in line with the vertical plane against which the subject's feet will be placed. The 0 inch is at the end that will be nearest the subject.

4. Cover the apparatus with polyurethane sealer or shellac.



ALTERNATE FLEXIBILITY TESTING APPARATUS

1. Find a sturdy cardboard box at least 12 inches tall. Turn the box so that the bottom is up. Tape a yardstick to the bottom. The yardstick must be placed so that the 9 inch mark is exactly in line with the vertical plane against which the subject's feet will be placed and the 0 inch end is nearer the subject.

2. Find a bench which is about 12 inches wide. Turn the bench on its side. Tape a yardstick to the bench so that the 9 inch mark is exactly in line with the vertical plane against which the subject's feet will be placed and the 0 inch end is nearer the subject.

Information on this page was taken from:
Cooper Institute for Aerobics Research (1992). The Prudential FITNESSGRAM: Test Administration Manual, Dallas, TX: Cureton, K.J., Appendix A.

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Equipment for the Construction of a Ramp

Items needed:

1, 3/4" plywood, 36" x 96"
1, 3/4" plywood, 36" x 48"
1, ½" x 3" x 36" steel nosing
nails, wood screws, stove bolts

Ramp Support

3 wood, 2" x (dimensions range from 0" to 7 ½") x 96"
1 wood, 2" x 3 3/4" x 33"
1 wood, 2" x 7 ½" x 33"

Rails

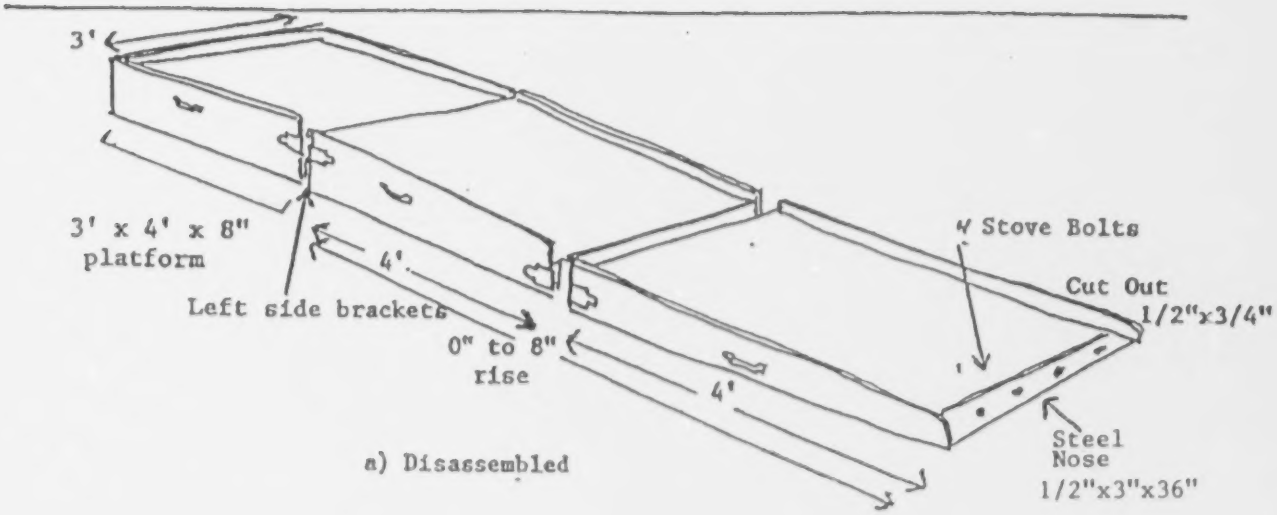
2 wood, 1" x (dimensions range from 2" to 10") x 96"
2 wood, 1" x 10" x 48"
1 wood, 1" x 10" x 36"

Handles and Brackets

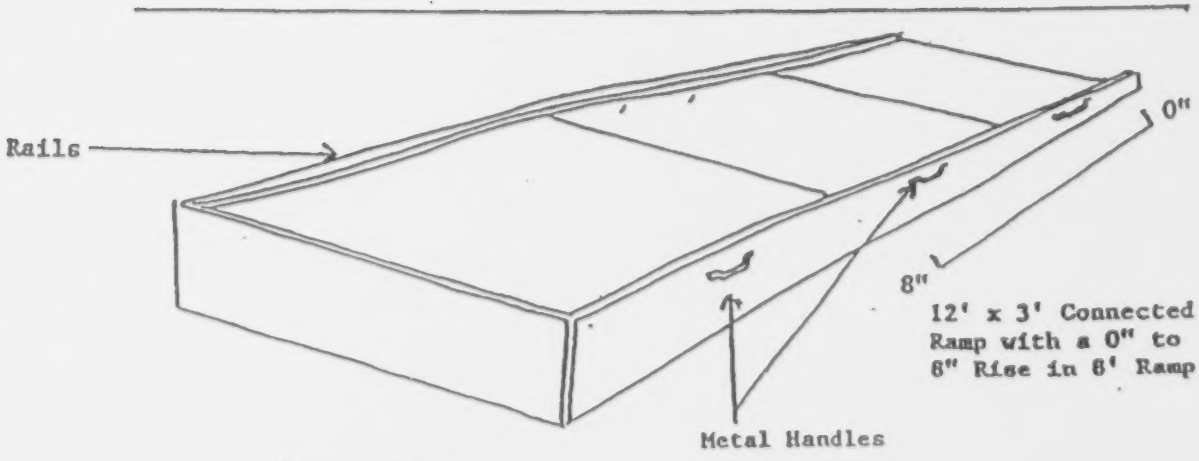
6 3 ½" metal handles
2 pair, left hand brackets
2 pair, right hand brackets

Procedure:

1. Cut out ½" deep x 3/4" back along the width of one end of ramp plywood for steel nosing.
2. Drill holes in plywood and steel nosing.
3. Apply steel nosing using 4 stove bolts
4. Assemble ramp in one piece using 2" x (dimensions ranging from 0" to 7 ½") x 96" base supports 18" apart (running lengthwise under plywood). Apply 3/4" x 36" x 96" plywood over supports using screws.
5. Assemble platform in the same way.
6. Cut ramp at 48" into two sections.
7. Apply rails 1" x (dimensions range from 2" to 10") x 96" to sides of ramp.
8. Apply rails 1" x 10" x 48" and one rail 1" x 10" x 36" to platform.
9. Apply two pair left side brackets and then two pair right side brackets to ramp. Brackets overlap to connect.
10. Apply six 3 ½" metal handles to sides of platform and ramp.



a) Disassembled



b) Assembled

Ramp and Platform

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Equipment for Modified Pull-up

Items needed:

1	3/4 in. plywood 24 in x 39 in for support platform
2	2 in x 8 in x 24 in pieces for base of uprights
2	2 in x 4 in x 48 in for uprights
1	1 1/8 in steel pipe for chinning bar
1	1 1/4 in dowel for top support
24	3/8 in dowel pieces cut 3 1/2 in long

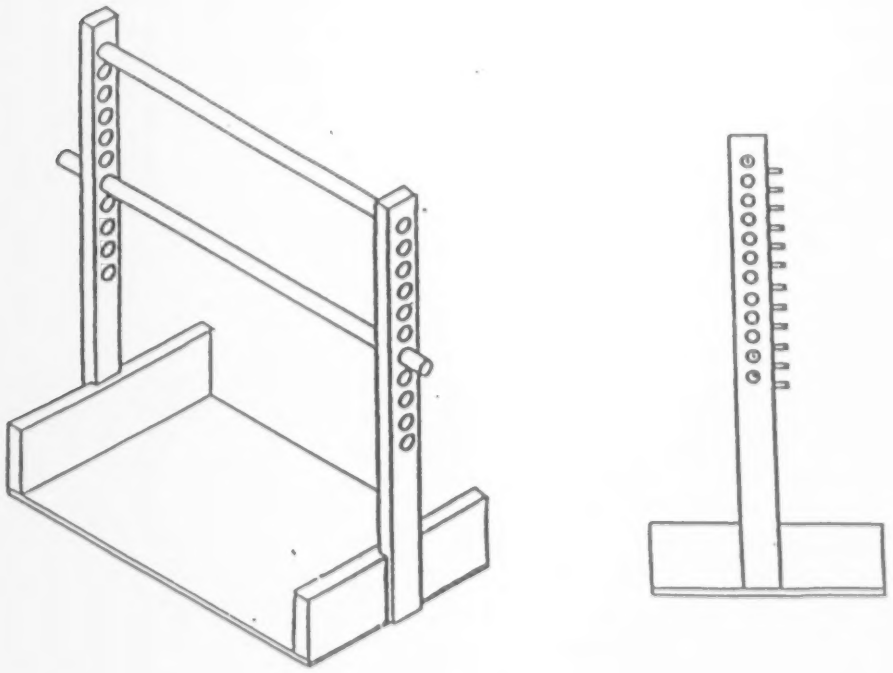
Nails, wood screws and wood glue for construction.

1. Beginning 2 1/2 in. from the top end of the 2 x 4 x 48 pieces drill 1 hole through the 2 inch width for the 1 1/4 in dowel support rod.

2. Drill 11 1 1/8 inch more holes below the first hole. Measuring 2 1/2 inches between the centers of these holes.

3. Beginning 3 3/4 inches from the top of these upright pieces drill 12 3/8 inch holes into the 4 inch width. Center these holes between the holes for the steel rod.

4. Assemble the pieces and finish with polyurethane or shellac.



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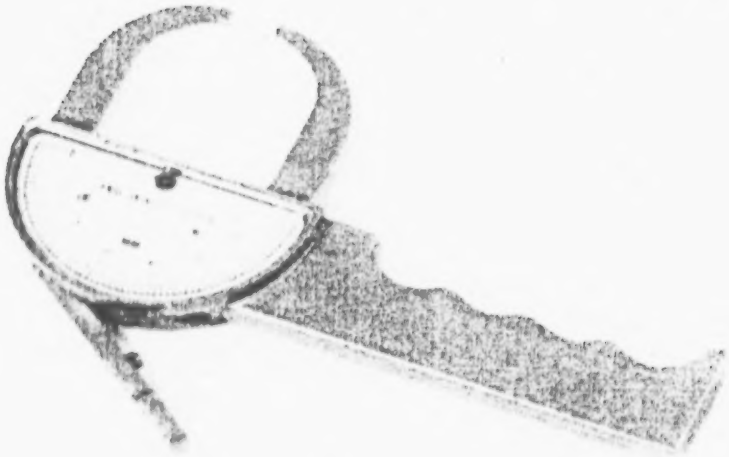

Lange Skinfold Caliper

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Appendix D

CONTRIBUTORS

Central Staff at the State University of New York
College at Brockport

Project Director:	Joseph P. Winnick
Project Coordinator:	Francis X. Short
	George Lawther (1993-94)
Graduate Assistants:	Kevin Biata
	Mary Powers
	Rob Korzeniewski
	Kevin Wexler
	Lori Erickson

Office of Special Education and Rehabilitative Services

Project Officer:	Melville Appell
	Doris Andres

Project Target Advisory Committee
and Panel of Experts

Kirk J. Cureton, Ph.D. - University of Georgia
Harold W. Kohl, Ph.D. - Baylor Sports Medicine Institute
Kenneth Richter, D.O. - Medical Director, United States Cerebral Palsy Athletic Association
James H. Rimmer, Ph.D. - Northern Illinois University
Margaret Jo Safrit, Ph.D. - American University
Roy J. Shephard, M.D., Ph.D., D.P.E. - The University of Toronto
Julian U. Stein, Ed.D. (retired) - George Mason University

Consultants

Patrick DiRocco	University of Wisconsin/LaCrosse
Bo Fernhall	George Washington University
Georgia Frey	Texas Tech University
Timothy G. Lohman	University of Arizona
Jeffrey McCubbin	Oregon State University
Paul Surburg	Indiana University

Field Testers

Dianne Agostinelli
Tim Baird
Matthew Beaty
Ron Berman
Kevin Biata
Kelly Bissell
Joel Blakeman
Karenne Bloomgarden
Carol Brun Del Re
Ed Carll
Mary Coe
Fiona Connor-Kuntz
Tim Coyle
Ben Drake
Kelda DePrez
Kathryn Efthimiades
Bo Fernhall
Deborah Follis
Jean Friedel
Ellen Gill
Gerard Gonsalves
Victoria Gross
Terri Hansen
David Haveman
Robert Korzeniewski
Wendy Kohler
Shelly Kron
Lauren Lieberman
Tosha Litwinski
Laura Mauer
Nancy McNulty
Alayne Miller
Stephen O'Hanlon
Kenneth Petetti
Travis Phillips
Elizabeth Pitts
Mary Powers
Dana Rieger
James Rimmer
Maria Rodriguez
Amy Roska
Laura Scala
David Seefeldt
Michelle Shea
Steve Skaggs
Louis Stadler
Eric Stern
Nancy Stubbs
Mary Szekely
Cindy Thomas
Lori Volding
Matthew Vukovich
Mary Walsh
Kevin Wexler
Matthew Wilkins
Stephanie White
Melissa Zurlo

Other Contributors

Jean Berry - Brockport, NY
Val Benzing - Brockport, NY
Dixie Butler - Brockport, NY
Michael Coriale - Brockport, NY
Mel Eisenback - New York City, NY
Robert Ellis - Brockport, NY
Arnie Epstein - New York City, NY
Jack Hogan - Brockport, NY
Sam Hughes - Houston Independent School District
Pat Johnson - Brockport, NY
Bob Jones - Brockport, NY
Brian Jones - Brockport, NY
Richard Kingdon - Brockport, NY
Robert Lewis - New York City, NY
Pam Maryjanowski - Empire State Games for the Physically Challenged
Gregory Packard - Brockport, NY
Fred Parker - Brockport, NY
Paul Ponchillia - Michigan Blind Athletic Association
Jack Purificato - Brockport, NY
Sister Seraphine Herbst - Rochester, New York
Joseph Setak - Brockport, NY
Pam Siedlecki - Brockport, NY
William Straub - Ithaca, NY
Wendy Wheeler - Brockport, NY

Testing Projects

Brockport Central School District	Brockport, NY
George Washington University Project	Washington, D.C.
Houston Independent School District	Houston, TX
Michigan State School for the Blind	Lansing, MI
New York City Public Schools	New York, NY
Empire State Games for the Physically Challenged	Brockport, NY
Northern Illinois Project	DeKalb, IL
Oregon State University	Corvallis, OR
School of the Holy Childhood	Rochester, NY
Western Michigan State University	Lansing, MI
Paralympic Games Atlanta, GA	